UNIVERSITY OF MICHIGAN LIBRARIES

Nuclear Science Abstracts is issued twice monthly (three times a month for Volume 1) by the Atomic Energy Commission. It is intended primarily to serve scientists and engineers working within the Atomic Energy Program by abstracting as completely and as promptly as possible the literature of nuclear science and engineering. It covers not only the unclassified and declassified research reports of the Atomic Energy Commission and its contractors, but also material in its field of interest which appears in technical and scientific journals and unpublished research reports of government agencies, universities, and industrial research establishments. The final issue (December 30) each year lists the domestic and foreign journals from which articles have been abstracted in Nuclear Science Abstracts.

Indexes

Volumes 1, 2, 3, and 4 of Nuclear Science Abstracts are cumulatively indexed by Author, Subject, and Nuclide in Volume 4, No. 24, Dec. 30, 1950. The cumulative Numerical Index of AEC Reports, described on the inside back cover, is published with Volume 4, No. 24.

Each issue of Volume 5 (1951) contains an Author Index and a current supplement to the cumulative Numerical Index of AEC Reports. The ninth, twelfth, and eighteenth issues have Subject and Author indexes cumulated for the preceding three months. The 24th issue will be the "Cumulative Index" for the year.

Availability

Nuclear Science Abstracts is available on an exchange basis to universities, learned societies, research institutions, industrial firms, and publishers of scientific information. The Atomic Energy Commission invites correspondence from such organizations looking toward the exchange of publications. Inquiries regarding such exchanges should be addressed as follows:

Technical Information Service
U. S. Atomic Energy Commission
Oak Ridge, Tennessee

Nuclear Science Abstracts is also available on a subscription basis at the following ($6.00) a year from:

Office of Technical Services
Department of Commerce
Washington 25, D. C.

For information on obtaining AEC declassified research reports see the inside back cover.

Issuing of these Abstracts does not constitute authority
for declassification of any reports.

Printed in U.S.A.
Price, 25 Cents

Chemistry Library
QC
770
.U56
v.5
no.14

NUCLEAR SCIENCE ABSTRACTS

Vol. 5, No. 14, July 30, 1951

TABLE OF CONTENTS

Category	Abstract	Page
REPORTS REFERENCE LIST		iii
GENERAL	3593	571
Atomic Power	3593	
BIOLOGY AND MEDICINE	3594	571
Radiation Effects	3601	
Radiation Hazards and Protection	3616	
Radiation Sickness	3621	
Radiography	3625	
Radiotherapy	3627	
Tracer Applications	3628	
CHEMISTRY	3634	577
Analytical Procedures	3644	
Crystallography and Crystal Structure	3651	
Deuterium and Deuterium Compounds	3653	
Fluorine and Fluorine Compounds	3654	
Graphite	3658	
Radiation Effects	3662	
Rare Earths and Rare-earth Compounds	3664	
Separation Procedures	3667	
Spectroscopy	3670	
Syntheses	3671	
Tracer Applications	3672	
ENGINEERING	3673	583
Heat Transfer and Fluid Flow	3674	
Vacuum System	3679	
MINERALOGY, METALLURGY, AND CERAMICS	3681	584
Ceramics and Refractories	3681	
Metals and Metallurgy	3686	
Minerals and Mineralogy	3696	
PHYSICS	3697	587
Cosmic Radiation	3699	
Instruments	3706	
Mass Spectrography	3719	
Measuring Instruments and Techniques	3721	
Mesons	3735	
Neutrons	3749	
Nuclear Physics	3750	
Nuclear Properties	3756	
Nuclear Transformations	3762	

Category	Abstract	Page
PHYSICS		
Particle Accelerators	3770	
Radiation Absorption and Scattering	3773	
Radiation Effects	3777	
Radioactivity	3778	
Theoretical Physics	3787	
AUTHOR INDEX		A
NUMERICAL INDEX OF AEC REPORTS		D
NNES ANNOUNCEMENT		E

REPORTS REFERENCE LIST

Vol. 5, No. 14

U. S. ATOMIC ENERGY COMMISSION DECLASSIFIED REPORTS

Report	Title, Author	Abstract
AECD-3142	Progress Report on Carnotite Studies; Carbonate Process; August 1949. K. B. Brown, C. F. Coleman, and W. R. Grimes.	3696
AECD-3147	Proposed Measurement of the Neutron-Helium Scattering Cross Section and Angular Distribution Between 0.6 and 2.5 Mev. H. Staub.	3773

U. S. ATOMIC ENERGY COMMISSION UNCLASSIFIED REPORTS

AECU-1278	Glycine as a Precursor of Bacterial Purines. W. B. Sutton, F. Schlenk, and C. H. Werkman.	3628
AECU-1279	The Use of Zirconium and Its Compounds as a Radiopaque Medium; Final Report. Barbara H. Polister.	3594
AECU-1280	The Gamma-Ray Yield of Phosphorus Bombarded with Protons. G. R. Grove and John N. Cooper.	3762
AECU-1281	The Metabolism of Radioactive Nicotinic Acid and Nicotinamide in the Rat. (abstract) B. Conner Johnson and Pei-Hsing Lin.	3629
AECU-1283	Nuclei from Normal and Leukemic Mouse Spleen; II. The Nucleic Acid Content of Normal and Leukemic Nuclei. Mary L. Petermann and Rose M. Schneider.	3595
AECU-1285	The Hot Atom Chemistry of the Propyl Bromides. (dissertation) Maurice S. Fox.	3662
AECU-1289	The Solubility, Activity Coefficients and Solubility Product of Manganese(II) Iodate. Anson Mack Hayes and Don S. Martin, Jr.	3634
AECU-1297	Quinone-Hydroquinone Exchange Reaction; I. Non-Exchange in Duroquinhydrone. Aksel A. Bothner-By.	3672
ANL-4579	The Properties of the Interstitial Compounds of Graphite; I. The Electronic Structure of Graphite Bisulphate. Gerhart Hennig.	3658
ANP-63	Means for Making Uniform Circular Heliarc Welds by Deflecting the Ion Beam Continuously. E. R. Mann.	3673
ISC-107	An Instrument for Internal Standard Flame Photometry and Its Application to the Determination of Calcium in the Rare Earths. Robert H. Heidel and Velmer A. Fassel.	3644
ISC-119	Nuclear Disintegration Studies with a Beta-Ray Spectrometer. William W. Pratt.	3721
K-728	Reactions of Polyfluoro Olefins; IV. Chemical Properties of Anionic Addition Products. Karl E. Rapp, John T. Barr, Roy L. Pruett, and Carl T. Bahner.	3654

REPORTS REFERENCE LIST

Report	Title, Author	Abstract
K-729	Specific Heat and Enthalpy of Liquid Lithium in the Range of 500° to 1000°C. A. G. Bates and D. J. Smith.	3686
K-733	Calibration Checking Device for Radiation Survey Instruments. S. A. Kingsbury.	3706
KAPL-P-232	Note on the Structure of Uranium; reprint from Acta Cryst. 2, Part 6, 420(1949) Dec. Joseph S. Lukesh.	3651
KAPL-P-451	Preparation of Ductile Vanadium by Calcium Reduction; reprint from J. Electrochem. Soc. 97, 311-15(1950) Oct. R. K. McKechnie and A. U. Seybolt.	3687
KAPL-P-452	Determination of Sodium Monoxide in Sodium; reprint from Anal. Chem. 22, 1283-6(1950) Oct. Leonard P. Pepkowitz and William C. Judd.	3645
KAPL-P-454	On the Symmetry of Graphite; reprint from Phys. Rev. 80, 226-9(1950) Oct. 15. Joseph S. Lukesh.	3659
KAPL-501	Report on Static Seal Test. Walter A. Heywood.	3679
KAPL-502	Spectroscopic Analysis of Deuterium in Hydrogen-Deuterium Mixtures. H. P. Broida and J. W. Moyer.	3670
NAA-SR-108	The Modulus of Rigidity of AUF and SA-25 Graphite from Room Temperature to 2000°C. F. E. Faris and C. A. Smith.	3660
NYO-732	Thermodynamic Study of Iron-Oxygen-Sulfur System; Third Quarterly Report. F. J. Dunkerley, J. L. Nichols, and V. V. Damiano.	3635
NYO-762	Progress Report No. 3; December 16, 1950–March 15, 1951. J. L. Everhart and E. L. Van Nuis.	3689
NYO-778	Magnetic Midplane Measurements. James Mates.	3770
NYO-786	On the Reactions $\pi + D = P + P$. W. B. Cheston.	3735
NYO-787	Meson Reactions in Hydrogen and Deuterium. R. E. Marshak.	3736
NYO-789	Meson Physics. R. E. Marshak	3737
NYO-888	The Contribution of the Pauli Moment to π Meson Production by Photons. M. F. Kaplon.	3738
NYO-1523	An Alpha Scintillation Counter for Laboratory Measurements. R. T. Graveson, H. T. DiGiovanni, and H. D. LeVine.	3722
NYO-1620	The Determination of Cardiac Output by a Continuous Recording System Utilizing the Injection of Iodinated (I^{131}) Human Serum Albumin. William J. MacIntyre, Walter H. Pritchard, Richard W. Eckstein, and Hymer L. Friedell.	3630
ORNL-957	Rates of Ion Exchange in Non-Aqueous Media. Franklin S. Chance, Jr.	3667
ORNL-968	Health Physics Division Quarterly Progress Report for Period Ending January 20, 1951. K. Z. Morgan, Director.	3616
ORNL-975	Fading Characteristics of Gamma Induced Coloration in High Density Glass. Robert H. Kernohan and Grace M. McCammon.	3777
SO-2502	Development of Zirconium Base Alloys; Seventh Quarterly Report (Progress Report Number 8). J. D. Nisbet.	3690

Report	Title, Author	Abstract
UCLA-113	Recommendations for Civil Defense Relative to Radiological Safety. Andrew H. Dowdy.	3617
UCLA-115	Biochemical Studies on Leukocytes; I. Phosphatase Activity in Health, Leukocytosis, and Myelocytic Leukemia. William N. Valentine and William S. Beck.	3596
UCLA-117	The Quantitative Measurement of Evans Blue (T-1824) and Acid Hematin in Tissue Homogenates. Raymond D. Goodman, Alvin E. Lewis, and Edward A. Schuck.	3646
UCLA-122	Biochemical Studies on Leukocytes; II. Phosphatase Activity in Chronic Lymphatic Leukemia, Acute Leukemia, and Miscellaneous Hematologic Conditions. William S. Beck and William N. Valentine.	3597
UCLA-123	Studies on Radiosensitivity of Bone Marrow; I. The Relative Sensitivity of Erythroid and Myeloid Elements. William N. Valentine and Morton Lee Pearce.	3601
UCLA-124	Studies on Radiosensitivity of Bone Marrow; II. The Effect of Large, Repeated Whole Body Irradiation Exposure on Hematopoiesis. William N. Valentine, Morton Lee Pearce, and John S. Lawrence.	3602
UCLA-125	Studies on Radiosensitivity of Bone Marrow; III. The Dynamics of Erythrocyte Regeneration after Hemorrhage and Irradiation. M. L. Pearce, M. A. Greenfield, and W. N. Valentine.	3603
UCRL-1090	Low Capacity Giant Fission Ionization Chamber. J. DeJuren.	3723
UCRL-1098	Evidence Concerning the Reaction $P + P \rightarrow \pi^+ + D$. Frank S. Crawford, Jr., Kenneth M. Crowe, and M. Lynn Stevenson.	3739
UCRL-1099	Mass Assignment of 14.6-Hour Yttrium Positron Activity. S. V. Castner.	3778
UCRL-1107	Meson to Proton Mass Ratios. Walter H. Barkas, F. M. Smith, and Eugene Gardner.	3740
UCRL-1131	Summary of the Research Progress Meeting of January 25, 1951. Bonnie E. Cushman.	3741
UCRL-1142	An Interpretation of Nuclear Cross Sections for High Energy Neutrons. Robert Jastrow.	3756
UCRL-1144	Carrier-Free Radioisotopes from Cyclotron Targets; XVI. Preparation and Isolation of Pd^{103} from Rhodium. Jeanne D. Gile, Herman R. Haymond, Warren M. Garrison, and Joseph G. Hamilton.	3668
UCRL-1166	An Attempt to Detect μ-Meson Pairs from 322-Mev Bremsstrahlung. J. W. Mather, E. A. Martinelli, and W. N. Jarmie.	3742
UCRL-1176	Summary of the Research Progress Meeting of January 4, 1951. R. K. Wakerling.	3743
UCRL-1187	Energy Spectrum of Electrons from μ-Meson. (abstract) Ryokichi Sagane, William L. Gardner, and Harmon Hubbard.	3744
UCRL-1198	Detection of Steroids in Paper Chromatography. David Kritchevsky and Martha R. Kirk.	3647
UR-157	Bacteriological Studies in the X-Radiated Dog. F. W. Furth, M. P. Coulter, and J. W. Howland.	3621

Report	Title, Author	Abstract
UR-158	The Effect of Aureomycin and Terramycin on the X-Radiated Rat. F. W. Furth, M. P. Coulter, and J. W. Howland.	3622
UR-160	A Quenching Circuit for Geiger-Mueller Counting of Carbon 14 as Carbon Dioxide. R. G. Vyverberg.	3724
Y-737	Continuously Variable Magnet Power Supply. W. D. Schultz.	3707

OTHER UNCLASSIFIED REPORTS OF SPECIAL INTEREST TO AEC LABORATORIES

AD-290(B)	A Quantitative Study of Percutaneous Absorption; III. Effect of Concentration and Solubility on Tracer Absorption of Sr^{89} from Intact and Abraded Skin and From Muscle in the Rat; Validity of Surface Counter Techniques. (Technical Objective AW 6). R. Kenneth Loeffler.	3633
AD-298(B)	Effects of Total Body X-irradiation on Blood Coagulation in the Rat. (Technical Objective AW 6). Stanton H. Cohn.	3609
AD-299(I)	The Performance of Lucite-Bonded Alpha Scintillation Screens. (Technical Objective AW 5a). R. H. Davis, J. D. Graves, and P. J. Harris.	3730
AD-307(B)	Changes in the Plasma Phospholipids in Rats Following Whole Body X-Irradiation. R. A. Neve and Cecil Entenman.	3606
AERE-C/M-100	Note on the Use of Tetra Ethylene Glycol (T.E.G.) as a Spreading Agent in the Preparation of Uniform Plutonium Sources. R. Hurst and K. M. Glover.	3716
AERE-I/R-638	Preparation and Use of Pile-Made Gamma Sources for Industrial Radiography. W. S. Eastwood.	3626
AERE-T/R-629	Some Notes on the Nature of Experiments, on the Statistics of Counting, and on the Fitting of Exponential Decay Curves to the Results of Counting Experiments. D. J. Behrens.	3733
AERE-X/R-608	A Mode-Separation Theory for Heavily-Strapped Magnetrons. A. W. Aikin.	3713
AML-NAM-AE-411033 Pt. 1.	Report on Investigation of the Corrosion Resistance of Titanium and Titanium Alloys. J. H. James.	3693
NACA-ACR-E5A29	Addition of Heat to a Compressible Fluid in Motion. Bruce L. Hicks.	3674
NACA-TN-2113	General Method for Computation of Equilibrium Composition and Temperatures of Chemical Reactions. Vearl N. Huff and Virginia E. Morrell.	3640
NACA-TN-2322	Creep of Lead at Various Temperatures. Peter W. Neurath and J. S. Koehler.	3691
NACA-TN-2326	Two-Dimensional Subsonic Compressible Flows Past Arbitrary Bodies by the Variational Method. Chi-Teh Wang.	3678
NAVORD-1572	On Turbulent Fluid Motion. (Aeroballistic Research Report Number 8). Max M. Munk.	3676
NEPA-1763	Optimum Distribution of Counting Time Between Background and Sample. W. E. Browning.	3729

Report	Title, Author	Abstract
NEPA-1790	Investigation of Some Metal-Ceramic Combinations as Coating Materials. W. A. Scholes.	3688
NP-1903	Aberrations Found in the Progenies of Plants Grown from Irradiated Cotton Seed. Meta S. Brown.	3604
NP-1927	Treatment of Infection Following Exposure to Ionizing Radiation. C. Phillip Miller and Carolyn W. Hammond.	3624
NP-1947	Quarterly Progress Report [Twentieth, for Three Month Period Ending December 1, 1950]. A. G. Hill, J. B. Wiesner, and G. G. Harvey.	3698
NP-1947(p.6-8)	Ionization Gauge Studies, p. 6-8 of Quarterly Progress Report [Twentieth for Three Month Period Ending December 1, 1950]. W. B. Nottingham and L. Sprague.	3680
NP-1947(p.33-43)	Microwave Spectroscopy, p. 33-43 of Quarterly Progress Report [Twentieth, for Three Month Period Ending December 1, 1950]. M. W. P. Strandberg, R. E. Hillger, G. W. King, R. B. Lawrance, B. F. Burke, J. R. Eshbach, B. V. Gokhale, J. G. Ingersoll, H. R. Johnson, and M. T. Weiss.	3760
NP-1947(p.44-6)	Magnet Laboratory Research. Nuclear Magnetic Resonances, p. 44-6 of Quarterly Progress Report [Twentieth, for the Period Ending December 1, 1950]. F. Bitter, N. I. Adams, III, J. Brossel, H. H. Plotkin, P. L. Sagalyn, and T. F. Wimett.	3759
NP-2273	The Kinetics of Heterogeneous Exchange Reactions; trans. from Arkiv. for Kemi 20A, 1-26(1945). Karl-Erik Zimens; tr. by C. Feldman.	3641
NP-3019	Progress Report; February 28, 1951. Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.	3697
NP-3031	Decrease of Adrenal Ascorbic Acid and Cholesterol in the Rat and Guinea Pig, Following Large Doses of Glutathione. M. M. Carey, E. P. Vollmer, R. L. Zwemer, and D. L. Spence.	3598
NP-3044	Periodic Status Report No. 25; Fundamental Properties of Metal-Ceramic Mixtures at High Temperatures; Progress During Period February 1, to March 31, 1951. W. B. Crandall and W. G. Lawrence.	3683
NP-3056	Statement of Progress for the Period 1 March 1951 to 1 April 1951. John A. Clark.	3677
NP-3057	The Vapor Pressure of Inorganic Substances; VI. Vanadium Between 1666°K and 1882°K. (8th Technical Report). James W. Edwards, Herrick L. Johnston, and Paul E. Blackburn.	3695
NRL-3793	The Ring Method of Measuring Surface Tension for Liquids of High Density and Low Surface Tension. H. W. Fox and C. H. Chrisman, Jr.	3642
ONRL-8-51	High Speed Electronic Differential Analyzer. W. Lewis Hyde.	3712
ONRL-21-51	Electronic Calculating Machines at S. E. A., Paris. Sherman C. Lowell.	3709

GENERAL

ATOMIC POWER

3593

POCKET ENCYCLOPEDIA OF ATOMIC ENERGY. Frank Gaynor. New York, Philosophical Library, 1950. 204p.

A comprehensive collection of brief explanations and definitions of concepts in the field of nuclear physics and atomic energy is presented in this volume.

BIOLOGY AND MEDICINE

3594

Minnesota Univ.
THE USE OF ZIRCONIUM AND ITS COMPOUNDS AS A RADIOPAQUE MEDIUM; FINAL REPORT. Barbara H. Polister. [nd] 26p. (AECU-1279)

Zr and its various compounds have been investigated in an attempt to produce a substance which would render brain tumors radiopaque, none were nontoxic enough for human use. Of all compounds investigated Na zirconyl citrate is the least toxic. The great vessels and kidneys of rabbits are shown very clearly by Na zirconyl citrate intravenously. ZrO_2 in methylcellulose as a suspension was used for gastrointestinal study of dogs and a few humans. The advantages of Zr over Ba as an x-ray medium are considered. Synthesis of water-soluble Zr compounds is discussed. Methods are described for the preparation of Na zirconyl citrate, Na zirconyl tartrate, zirconyl acetate, KZr oxalate, the gluconate salt of Zr, Zr phylate solution (in oxalic acid), Zr molate, NaZr glucolate, and NaZr mandelate.
20 references.

3595

Sloan-Kettering Inst. of Cancer Research
NUCLEI FROM NORMAL AND LEUKEMIC MOUSE SPLEEN; II. THE NUCLEIC ACID CONTENT OF NORMAL AND LEUKEMIC NUCLEI. Mary L. Petermann and Rose M. Schneider. [nd] 13p. (AECU-1283)

Nuclei have been isolated from the spleens of mice carrying transplanted and spontaneous leukemia. The nuclei prepared from spleens of mice with transplanted leukemia contained more than 4 times as much pentose nucleic acid (PNA) (per nucleus) as those from normal spleens; their desoxypentose nucleic acid (DNA) and N contents were also greatly increased. In spontaneous leukemia, on the other hand, the nuclear PNA was but slightly increased, and the DNA and N contents were normal.

3596

Atomic Energy Project, Univ. of California, Los Angeles
BIOCHEMICAL STUDIES ON LEUKOCYTES; I. PHOSPHATASE ACTIVITY IN HEALTH, LEUKOCYTOSIS, AND MYELOCYTIC LEUKEMIA. William N. Valentine and William S. Beck. Feb. 14, 1951. 26p. (UCLA-115)

Quantitative studies on the alkaline and acid phosphatase content of isolated leukocytes are reported. Striking differences in the levels of phosphatase activity were noted between the leukocytes of health, leukocytosis, and chronic myelocytic leukemia. In general, there were found high alkaline–normal acid phosphatase levels in leukocytosis and low alkaline–normal to high acid phosphatase levels in chronic myelocytic leukemia. The data on alkaline phosphatase in leukocytosis and chronic myelocytic leukemia did not overlap, with the exception of one patient. The literature on the chemical constituency of leukocytes has been reviewed, and emphasis has been placed on the emerging patterns of chemical and enzymatic activity in the leukocytes of health, leukocytosis, and leukemia. It is thought that the chief value of such data lies in their fundamental implications regarding the nature of the abnormality and, in addition, that they provide a basis for new diagnostic techniques. (auth)

3597

Atomic Energy Project, Univ. of California, Los Angeles
BIOCHEMICAL STUDIES ON LEUKOCYTES; II. PHOSPHATASE ACTIVITY IN CHRONIC LYMPHATIC LEUKEMIA, ACUTE LEUKEMIA, AND MISCELLANEOUS HEMATOLOGIC

CONDITIONS. William S. Beck and William N. Valentine. Apr. 2, 1951. 20p. (UCLA-122)

Determinations of alkaline and acid phosphatase activity have been done on the leukocytes of chronic lymphatic leukemia, acute leukemia, and a variety of hematologic disorders. Both chronic lymphatic and acute leukemia tend to show low acid and alkaline activity levels per 10^{10} cells as compared to chronic myelocytic leukemia in which the alkaline phosphatase is low and acid phosphatase activity greater than normal and physiologic leukocytosis in which the alkaline phosphatase is extremely high. The low phosphatase activity in these groups may be attributable to the low percentages of normal myeloid and lymphoid cells per 10^{10} leukocytes. Three cases of polycythemia vera showed elevated leukocyte alkaline phosphatase activity. These changes may be clues to fundamental metabolic aspects of these conditions. (auth)

3598

Naval Medical Research Inst., Bethesda
DECREASE OF ADRENAL ASCORBIC ACID AND CHOLESTEROL IN THE RAT AND GUINEA PIG, FOLLOWING LARGE DOSES OF GLUTATHIONE. M. M. Carey, E. P. Vollmer, R. L. Zwemer, and D. L. Spence. Dec. 27, 1950. 7p. (NP-3031)

Glutathione, in a dosage that increases potassium tolerance in mice (400 mg/100 g body weight), decreased adrenal ascorbic acid and cholesterol in rats and guinea pigs. Adrenal recovery occurs within 24 hr in rats but takes longer in guinea pigs. Glutathione also gave evidence of toxicity, having an LD_{50} of 300 and 830 mg/100 g for guinea pigs and mice, respectively, and an approximate MLD of 700 mg/100 g for rats. (auth)

3599

LES ISOTOPES RADIOACTIFS EN MÉDECINE ET EN BIOLOGIE. Maurice Tubiana. Paris, Masson et Cie, 1950. 392p.

After discussing the problems of detecting and measuring radioactivity, the author, who collected much of his material while visiting the United States, treats of clinical applications of tracers and of radioisotope therapy, especially the use of P^{32} and I^{131}, with particular attention being paid to practical aspects. A more complete review of this book may be found in Bruxelles-méd. 31, 327(1951) Feb. 11.

3600

ON THE SHARPENING OF MICROTOME KNIVES FOR ULTRA-THIN SECTIONING. James Hillier. Rev. Sci. Instruments 22, 185-8(1951) Mar.

Conventional methods of sharpening involve extensive grinding which is primarily for the removal of large nicks but which serves the additional purpose of fitting the knife to the sharpening means. Since large nicks rarely occur in ultra-thin microtomy, the grinding would become unnecessary if the fitting of the knife to the sharpening means could be made permanent. A permanently attached short sharpening back is described which makes this possible. Using the finest abrasives and polishing powders and prepared glass plates as the sharpening surfaces, it is possible to resharpen a knife in less than 10 min. The method is described in detail. (auth)

RADIATION EFFECTS

3601

Atomic Energy Project, Univ. of California, Los Angeles
STUDIES ON THE RADIOSENSITIVITY OF BONE MARROW; I. THE RELATIVE SENSITIVITY OF ERYTHROID AND MYELOID ELEMENTS. William N. Valentine and Morton Lee Pearce. Apr. 4, 1951. 29p. (UCLA-123)

A comparison has been made of (a) the regenerative capacity of erythroid tissue in irradiated and nonirradiated cats, and (b) the relative regenerative capacity of myelopoietic and erythropoietic tissue in the same animals after the same irradiation injury, by irradiating animals immediately after a large acute hemorrhage of 40% of the circulating red cell mass. Dosage employed was 200 r to the whole body. Recovery from standard anemia was only slightly slower in the irradiated than in the control group. However, myelopoiesis was severely depressed for more than 30 days. These data suggest that on the basis of functional impairment, erythropoietic tissue is significantly less sensitive to radiation injury than is the myelopoietic tissue of the same animal.

3602

Atomic Energy Project, Univ. of California, Los Angeles
STUDIES ON THE RADIOSENSITIVITY OF BONE MARROW; II. THE EFFECT OF LARGE, REPEATED WHOLE BODY IRRADIATION EXPOSURE ON HEMATOPOIESIS. William N. Valentine, Morton Lee Pearce, and John S. Lawrence. Apr. 16, 1951. 15p. (UCLA-124)

Six cats were subjected to four whole-body irradiation exposures over a period of 1½yr. Irradiation dosage was 200 r to the whole body. Irradiation in each case was immediately preceded by a large phlebotomy, so that functional impairment of erythropoiesis resulting from irradiation could be assessed in terms of a defective regeneration of erythrocytes. Little evidence of permanent functional damage of erythropoietic tissue by repeated exposures under the conditions of this experiment were observed. Hemoglobin regeneration was slightly slower after the fourth and last irradiation. Whether this represents encroachment on marrow reserve by multiple irradiations or whether it was an artifact resulting from iron deficiency cannot be said with certainty. Multiple exposures exerted little apparent effect on the leukocyte regeneration curves.

3603

Atomic Energy Project, Univ. of California, Los Angeles
STUDIES ON THE RADIOSENSITIVITY OF BONE MARROW; III. THE DYNAMICS OF ERYTHROCYTE REGENERATION AFTER HEMORRHAGE AND IRRADIATION. M. L. Pearce, M. A. Greenfield, and W. N. Valentine. Apr. 19, 1951. 15p. (UCLA-125)

A method for the calculation of "birth rate" of erythrocytes in the face of a changing blood count is presented in terms of life-span data. By setting up the dynamics of erythrocyte regeneration in terms of a two-compartment system, an

equation is derived to predict expected red-cell count at any time after hemorrhage. The regeneration of erythrocytes after hemorrhage in irradiated and nonirradiated cats is compared with predicted values. (auth)

3604

Naval Medical Research Section, Joint Task Force One
ABERRATIONS FOUND IN THE PROGENIES OF PLANTS GROWN FROM IRRADIATED COTTON SEED. Meta S. Brown. [nd] 10p. (NP-1903)

A report has been presented previously (NSA 4-5568) giving a cytological description of 14 cotton, Gossypium hirsutum, plants grown from seeds exposed to γ radiation at Bikini. Plants grown from seeds harvested from these 14 cotton plants have now been studied for possible mutations and other transmitted changes. It is concluded that, although chromosome breaks are readily induced, gene mutations are infrequent.

3605

CHANGES IN THE ELECTRIC CHARGE OF ERYTHROCYTES OBSERVED IN IRRADIATED ANIMALS. Gaston Meyniel and Suzanne Bazin. Compt. rend. soc. biol. 144, 1463-5 (1950) Nov. (In French)

The effect of ionizing radiations on the electric charge of blood corpuscles was examined by totally irradiating guinea pigs with doses of x rays slightly inferior to the threshold lethal dose. An electrophoretic study of erythrocytes showed a 25% diminution of their surface charge, appearing on the 7th day after the irradiation. Since the phenomenon is observed only in the presence of the serum of the animals, it is concluded that it is directly correlated with alterations in the proteinic fraction of the blood serum.

3606

Naval Radiological Defense Lab.
CHANGES IN THE PLASMA PHOSPHOLIPIDS IN RATS FOLLOWING WHOLE BODY X-IRRADIATION. R. A. Neve and Cecil Entenman. Apr. 10, 1951. 17p. (AD-307(B))

Changes in the plasma phospholipid phosphorus (PLP^{31}) of fasted female rats have been determined following whole-body, 250-kv, x-irradiation, with doses ranging from 750 to 5000 r. Irradiation causes marked increases in the plasma level of PLP^{31}. After 750 r the plasma level of PLP^{31} reaches a maximum at the second to third post-irradiation day. The plasma level of PLP^{31} after doses of 750, 1500, 2500, 3500 and 5000 r was, respectively, 6.47, 7.10, 7.78, 8.63, and 9.92 mg %, 2 days after irradiation. Plasma protein levels remained constant over two days after irradiation. Plasma volume, determined in some of the experiments, showed little or no change over an interval of 5 days after irradiation. (auth)

3607

EFFECT OF HIGH CONCENTRATION OF PHOSPHORUS-32 ON GROWTH OF THE POTATO. W. K. Sinclair and W. R. Stanton. Nature 167, 234-5(1951) Feb. 10.

The effects of experiments with P^{32} on three varieties of potatoes are described. Individual sprouts obtained from the chitted daughter tubers were given amounts of 10 and 100 μc per plant. Several abnormalities became visible in the treated plants. These included increased fleshiness of the leaves, loss of secondary leaflets, and increased branching.

3608

EFFECT OF ROENTGEN-RAY RADIATION ON THE BIOSYNTHESIS OF NUCLEIC ACIDS AND NUCLEIC ACID PURINES. Howard E. Skipper and Jack H. Mitchell, Jr. Cancer 4, 363-6(1951) Mar.

Roentgen-ray radiation (950 r) has been shown to inhibit the incorporation of radioactive carbon from bicarbonate and formate into viscera nucleic acids and nucleic acid purines over a period of 6 hr. Under similar conditions, fixation of carbon from these compounds into viscera homogenate appeared to be increased somewhat following roentgen-ray radiation. Glutathione had no apparent effect on the radiation-induced nucleic acid inhibition. (auth)

3609

Naval Radiological Defense Lab.
EFFECTS OF TOTAL BODY X-IRRADIATION ON BLOOD COAGULATION IN THE RAT. (Technical Objective AW 6). Stanton H. Cohn. Mar. 2, 1951. 23p. (AD-298(B))

The hemorrhagic syndrome following exposure of rats to 400 r of x irradiation was studied, and a blood coagulation defect was found. Although the Lee-White clotting time was determined to be normal following irradiation, the clotting defect was quantitatively reflected by an increased heparin clotting time and by alterations in blood resistance measurements. The thrombocytopenia following exposure of rats to radiation appears to be a major factor in the defective clotting and consequent hemorrhage. The heparin clotting time measurements and electrical resistance measurements presented in this paper provide quantitative baselines for the clotting reactions of normal and irradiated animals. These values may be used as standards in evaluation of various methods of prevention and treatment of the spontaneous bleeding. (auth)

3610

IONIZING RADIATION AND BLOOD-FORMING TISSUES. J. Am. Med. Assoc. 144, 1182-3(1950) Dec. 2. (Editorial)

A short discussion is presented on studies of normal laboratory animals exposed to single doses of whole-body irradiation in the LD_{50} range. This review shows that the bone marrow and the lymphatic structures go through the following phases: destruction characterized by disintegration of cells, active phagocytosis of the cellular debris, atrophy, and regeneration. A comparison is made between the effect of whole-body irradiation and the effect of non-irradiation of certain tissues, such as the spleen, on heavily irradiated tissues elsewhere in the body.

3611

ON THE MUTATION THEORY OF THE ORIGIN OF CANCER. B. Rajewsky. Z. Krebsforsch. 56, 274-84(1949). (In German)

The cancerogenic properties of ionizing radiations were examined, in the light of the cell-mutation theory, on white mice submitted to the action of x rays and α particles. The latter were introduced into the animals' bodies by adding radon, in various concentrations, to the air of the cage. The main result was the discovery of the strong tumor-producing effect of very small doses of α rays. With increasing time of exposure to feeble α radiations, a whole series of tumors from benign adenoma to adenocarcinoma and bronchial cancer was obtained.

3612

PATHOLOGY OF IONIZING RADIATION. Elbert De Coursey. Minnesota Med. 34, 313-16, 318(1951) Apr.

The lymphoid and hematopoietic tissues, and the skin, genital organs, and gastrointestinal tract are reported to be the most severely affected by ionizing radiation from an atomic bomb explosion. In victims of the Hiroshima and Nagasaki blasts there was atrophy of lymphoid elements in lymph nodes, tonsils, spleen, and gastrointestinal tract. Atrophy of the bone marrow was evident early, and it either continued or was followed by focal or diffuse hyperplasia with maturation arrest. Necrotizing inflammation of the oropharynx was prominent but limited to the 3rd to 6th week. The scalp showed the surest external gross sign of ionization, alopecia, which, with hemorrhagic manifestations, appeared about the same time as the throat lesions. The testes showed prominent microscopic changes, with almost every sex cell destroyed in all men who died. The ovaries showed very little more than extreme scarcity of proliferating follicles. In all time periods the intestinal mucosa was the seat of changes which varied from ulcerated hemorrhagic foci to focal or widespread necrosis and ulceration with formation of diphtheritic membranes. (auth)

3613

RADIATION EFFECTS IN PLANT NUTRITION EXPERIMENTS WITH PHOSPHORUS-32. C. Bould, D. J. D. Nicholas, and W. D. E. Thomas. Nature 167, 140-2(1951) Jan. 27.

NaH_2PO_4, used as a carrier and labeled with 0 to 500 μc of P^{32}, has been used in a study of radiation effects on the growth and physiology of barley and tomato plants. The plants were harvested when 22 days old, and the total phosphate was determined in the tops and roots. It was found that the effects of radiation were slight and were not sufficient to preclude the use of P^{32} in plant-nutrition studies.

3614

RADIATION EFFECTS ON LIVER GLYCOGEN IN THE RAT. M. H. Ross and J. O. Ely. J. Cellular Comp. Physiol. 37, 163-71(1951) Feb.

A total of 830 rats were irradiated with x rays or neutrons in a study of the effects of irradiation on the amount of hepatic glycogen in the liver. Glycogen deposits were found after irradiation in the liver cells of rats fasted prior to and after irradiation. Glycogen deposits were also found in fasted irradiated rats after shielding various portions of the body. From these results it was deduced that the effect of radiation on glycogen deposition is not a primary one.

3615

STUDIES IN THE GENETICS OF SOME X-RAY-INDUCED MORPHOLOGICAL MUTANTS IN COPRINUS LAGOPUS. Ursula Mittwoch. J. Genetics 50, 202-5(1951) Jan.

The method used for the culture of the hymenomycetes fungus Coprinus lagopus and for the production of x-ray mutants is described. The mating type exhibited is outlined, and the independent inheritance of the mating-type genes is shown. Four morphological mutants were found, one of which is linked with one of the mating-type genes. The action of natural selection with regard to the binucleate condition of the secondary mycelium is discussed.

RADIATION HAZARDS AND PROTECTION

3616

Oak Ridge National Lab.
HEALTH PHYSICS DIVISION QUARTERLY PROGRESS REPORT FOR PERIOD ENDING JANUARY 20, 1951. K. Z. Morgan, Director. Mar. 21, 1951. 24p. (ORNL-968)

Progress during this period on development of a constant water monitor, radioactive-waste-disposal research survey of White Oak Creek drainage system, theoretical physics (fast-neutron tolerance calculations, effective atomic number for compounds, etc.), analytical procedure for analysis of Pu in river water, neutron dosimetry, dosimetry within shielding, personnel β-ray monitoring, and education and training are summarized briefly, few data being given. Work on the measurement of neutron dosage with piezoelectric crystals, modification of the conventional γ-ray pocket meter, particle film microscopy, and scattering of β radiation from various collector materials in an extrapolation chamber are reported in more detail.

3617

California Univ., Los Angeles
RECOMMENDATIONS FOR CIVIL DEFENSE RELATIVE TO RADIOLOGICAL SAFETY. Andrew H. Dowdy. Feb. 15, 1951. 57p. (UCLA-113)

Atomic Bomb Phenomena That Pertain to Radiation Hazards. A factual, simple explanation of the atomic bomb phenomena specifically relating to radiation hazards under various conditions of detonation is given. The material presented has been abstracted and condensed from various official publications representing the best available information at this time. Anti-Personnel Effects and Emergency Exposure Levels. The antipersonnel effects and probable effects resulting to humans exposed to acute total-body irradiation, represent the considered opinions of authorities as obtained from official and semiofficial publications. The emergency exposure levels represent the thinking of the author and his associates, based on long and careful consideration of the many variables implicit in the atomic bombing of a metropolitan area. Prevention of Contamination. This section is largely an expression of the thinking of the group responsible for the compilation of this report. Some of the dosage levels (contamination levels) and the suggested procedures doubtless will be challenged. If so, the desired objective will be achieved provided a sound and acceptable solution can be arrived at for the conduct of receiving stations and hospitals, and the efficient and ef-

fective care of casualties. Diagnosis and Treatment of Radiation Injuries. The available information on the subject is presented in condensed form. Content and Duration of Training Courses. A sufficient number of types of training courses is presented to prepare adequately those concerned with the radiological aspects of civilian defense. Information to the General Public. Information to the public perhaps represents the most important aspect of civilian defense and needs careful consideration. Premature and unofficial information can and will defeat an otherwise effective program.

3618

HEALTH HAZARDS FROM COSMIC RADIATION AT HIGH ALTITUDE. H. J. Schaefer. Tech. Data Dig. 15, No. 10, 21-6(1950) Oct. (See also NSA 5-2076)

The total ionization in living tissue produced by cosmic-ray showers at different altitudes is deduced from available numerical data. It is concluded that there is no danger of human beings above 70,000 ft being killed instantly or within a short time by the heavy-nuclei rays, but that harmful effects are slowly accumulated.

3619

MEASUREMENT OF RADIOACTIVITY IN HUMAN BREATH. A. H. Ward. Nature 167, 600(1951) Apr. 14. (Letter to the editor)

Alpha activity in the breath from patients with Ra or Th in their bodies has been measured by two methods. The first uses the α radiation breath-monitor, type A.E.R.E. 1056A, which is designed primarily for radon measurements and is not so suitable for quickly decaying activities. The second method permits continuous-flow measurements and has been developed at Harwell. Details of the continuous-flow counter are given. Results obtained indicate that patients having Th in their bodies have concentrations in the breath of about 100 to 300 $\mu\mu$c/liter. The corresponding Th burden is 2 to 10 g, initially equivalent to 0.2 to 1.0 μc. At most, 1% of the produced Tn(Rn^{220}) escapes in the breath. The Ra-Rn tolerance figures are as follows: 40% of the total emanation produced from 0.1 μg Ra fixed in the body escapes in the breath giving the accepted tolerance dose 1 $\mu\mu$c/liter of breath.

3620

RADIATION PROTECTION FROM THE INDUSTRIAL HYGIENE STANDPOINT. John C. Soet. Ind. Med. Surg. 20, 227-33(1951) May.

Industrial hygiene and safety are discussed with reference to x rays from fluoroscopes in hospitals and shoe stores, industrial applications as in welding tests, in prisons for the detection of concealed weapons, etc. It is stated that use of natural radium is more widespread in industry than are pile-produced radioactive materials. Lack of portability of x-ray machines versus easy transportation of radioisotopes with attendant radiation hazards is discussed.

RADIATION SICKNESS

3621

Atomic Energy Project, Univ. of Rochester
BACTERIOLOGICAL STUDIES IN THE X-RADIATED DOG. F. W. Furth, M. P. Coulter, and J. W. Howland. Feb. 23, 1951. 20p. (UR-157)

Bacteriological studies have been made on a group of 24 dogs that received 450 r whole-body x radiation. Twelve of these animals were treated with aureomycin following radiation; the remainder served as controls. Blood culture studies following radiation indicated that the incidence of positive cultures was greater in the control group than in the treated group. Bacteria isolated from blood and autopsy cultures from control dogs were sensitive to aureomycin, while those isolated from autopsy material from treated dogs were resistant. Quantitative analysis of the fecal flora showed that the number of coliform organisms and staphylococci increased in all animals postradiation. However, the coliforms increased to a greater extent in the treated dogs. The fecal coliform organisms and streptococci from the treated dogs became highly resistant to aureomycin following therapy. 13 references. (auth)

3622

Atomic Energy Project, Univ. of Rochester
THE EFFECT OF AUREOMYCIN AND TERRAMYCIN ON THE X-RADIATED RAT. F. W. Furth, M. P. Coulter, and J. W. Howland. Feb. 14, 1951. 14p. (UR-158)

Two antibiotics, aureomycin and terramycin, were administered in therapeutic amounts to a group of rats that had received 700 r of total body x radiation. Both these antibiotics, when given orally starting immediately after irradiation, markedly lowered the incidence of the diarrhea which occurs in the x-radiated rat. The antibiotics also favorably influenced the regain of weight after irradiation. Aureomycin had no effect on the mortality, but terramycin apparently decreased the total mortality. (auth)

3623

EFFECT OF PERORAL ADMINISTRATION OF AUREOMYCIN ON THE SURVIVAL OF RATS EXPOSED TO LETHAL DOSES OF X RAYS. G. Lambert, J. Maisin, M. Mandart, E. Pluygers, and G. Podio. Compt. rend. soc. biol. 144, 1558-60(1950) Nov. (In French)

Severe leukocytopenia, observed in animals submitted to lethal x-ray doses, points to infection as a possible cause of death. Rats totally irradiated with 500 and 600 r received aureomycin hydrochloride (6 mg twice daily) by mouth until death, or until the 21th day in cases of long survival. Although in the 500-r group this treatment produced a notable increase in the survival rate, no favorable result was observed in the 600-r group.

3624

Chicago Univ.
TREATMENT OF INFECTION FOLLOWING EXPOSURE TO IONIZING RADIATION. C. Phillip Miller and Carolyn W. Hammond. [nd] 6p. (NP-1927)

Cultures of heart blood and spleen of mice subjected to a single dose of 450, 550, or 600 r of x irradiation showed a high incidence of bacteremia during the second week, the period of greatest mortality. The bacteremia was caused by microorganisms normally present in the lower bowel of the stock mice. Control of this infection by means of appropriate antibiotics caused a significant reduction in

mortality. Of the antibiotics tried, streptomycin was the most effective. Its disadvantage derives from the rapidity with which bacteria can develop resistance to it. Next in order of therapeutic value were chloramphenicol, aureomycin, and terramycin given by mouth and reinforced by subcutaneous streptomycin during the critical period, the second week postirradiation.

RADIOGRAPHY

3625

MICRORADIOGRAPHY IN BIOLOGY. G. A. G. Mitchell, Brit. J. Radiology 24, 110-17(1951) Feb.

After reviewing the literature, the author describes a method of displaying details of animal or vegetable tissues by microradiography, following preliminary staining or impregnation with metallic salts. It is shown that current ideas about argyrophil and argyrophobe fibers are not substantiated by x-ray investigation, and that certain features not otherwise readily detectable may be revealed by microradiography. Examples of the use of microradiography in studying various biological problems are given and brief technical details are supplied. The limitations of the method are mentioned and it is emphasized that x-ray methods are an adjunct to, and not a substitute for, ordinary histology. (auth)

3626

Atomic Energy Research Establishment, Harwell, Berks. (England)
PREPARATION AND USE OF PILE-MADE GAMMA SOURCES FOR INDUSTRIAL RADIOGRAPHY. W. S. Eastwood. Dec. 1950. 8p. (AERE-I/R-638)

Problems of half life, energy, radiation simplicity, and nuclear-capture cross section in the selection and production of radiographic γ-ray sources are considered. Co^{60}, Eu^{154}, Ta^{182}, Sb^{124}, and Sc^{46} are found suitable for hard-γ sources; Ir^{192}, Se^{75}, and Hf^{181} for medium; and possibly $Ce^{144}-Pr^{144}$ as a soft soruce. The sources, Al capsules, calibration techniques, and handling tools are illustrated. 7 figures.

RADIOTHERAPY

3627

INTERSTITIAL RADIUM THERAPY. C. F. Lehmann and J. L. Pipkin. Arch. Dermatol. Syphilol. 63, 312-22(1951) Mar.

A short intensive radiation technique was used in the treatment of superficial carcinoma of the skin. In this method of treatment more intensive radiation doses are given patients for a shorter period of time as compared to the low-intensity method wherein radiation doses are given over a long period. The needles used in this treatment contain 10 mg of Ra and are 19 mm long and 1.3 mm in diameter. A discussion is made of the methods of treatment used in special locations including eyelids, nose, and lips. Advantages of this type of treatment are distribution of Ra with maximum efficiency and the ideal cosmetic result obtained.

TRACER APPLICATIONS

3628

Iowa State Coll.
GLYCINE AS A PRECURSOR OF BACTERIAL PURINES. W. B. Sutton, F. Schlenk, and C. H. Werkman. [nd] 9p. (AECU-1278)

The synthesis of purines in Aerobacter aerogenes was studied by the use of doubly labeled glycine ($CH_2N^{15}H_2\ C^{13}OOH$). Adenine and guanine were isolated from the lyophilized cell material. The isotopes were found in the bases. Evidence for the incorporation of the whole glycine molecule is presented. (auth)

3629

Illinois Univ.
THE METABOLISM OF RADIOACTIVE NICOTINIC ACID AND NICOTINAMIDE IN THE RAT. (abstract) B. Connor Johnson and Pei-Hsing Lin. Jan. 11, 1951. 1p. (AECU-1281)

The report is reproduced here in its entirety.

Nicotinic acid and nicotinamide labeled with radiocarbon in the carboxyl position were given by intraperitoneal injection to individual rats, and expired CO_2, urine, and feces were collected. Radioautographs were prepared of paper-strip chromatograms of the urine from each rat. Following nicotinic acid administration the radioautographs showed the presence of 7 metabolic excretion products, of which 4 could be identified by their R_f values compared to known compounds. The approximate relative amounts of each product excreted are as follows: N^1-methylnicotinamide 2.7%, nicotinuric acid 60.9%, nicotinic acid 24.4%, nicotinamide 0.26%, and three unidentified compounds which accounted for 3.5, 7.7, and 0.48%, respectively, of the activity excreted. Following nicotinamide administration, 9 radioactive excretion products were found on paper chromatograms, of which 4 could be identified. The approximate relative amounts of each compound excreted were as follows: N^1-methylnicotinamide 66.9%, nicotinuric acid 0.9%, nicotinic acid 6.6%, nicotinamide 4.1%, and 5 unidentified compounds which accounted for 6.1, 10.8, 0.8, 1.0, and 2.4%, respectively, of the activity excreted.

3630

Western Reserve Univ. School of Medicine
THE DETERMINATION OF CARDIAC OUTPUT BY A CONTINUOUS RECORDING SYSTEM UTILIZING THE INJECTION OF IODINATED (I^{131}) HUMAN SERUM ALBUMIN. William J. MacIntyre, Walter H. Pritchard, Richard W. Eckstein, and Hymer L. Friedell. Mar. 2, 1951. 23p. (NYO-1620)

A method is outlined for the determination of cardiac output by the injection of I^{131}-iodinated human serum albumin and continuous recording of the dilution curve. The calibration of the flow system by means of the final dilution and blood volume is discussed along with the possible application to an external measuring method. The results of eight dilution curves obtained from dogs are presented, and the calculated

cardiac outputs are compared with the values measured by the rotameter method. (auth)

3631

CARBAMATES IN THE CHEMOTHERAPY OF LEUKEMIA. VIII. OVER-ALL TRACER STUDIES ON CARBONYL-LABELED URETHAN, METHYLENE-LABELED URETHAN, AND METHYLENE-LABELED ETHYL ALCOHOL. Howard E. Skipper, Leonard L. Bennett, Jr., Carl E. Bryan, Locke White, Jr., Margaret Ann Newton, and Linda Simpson. Cancer Research 11, 46-51(1951) Jan.

Over-all tracer studies have been carried out on carbonyl- and methylene-labeled urethan, $NaHC^{14}O_3$, and methylene-labeled ethyl alcohol. The rate of expiration of C^{14} following injection of these compounds, the percentage of the total activity retained by mice at 24 hr, and the general distribution of radioactivity suggest that urethan is eventually hydrolyzed in vivo to CO_2, ethyl alcohol, and ammonia. A mouse with advanced spontaneous mammary carcinoma has been observed to retain 36% of the C^{14} from methylene-labeled urethan at 24 hr, whereas normal controls retained but about 7.3% of the same atom from this radioactive compound. (auth)

3632

DETERMINATION OF SODIUM^{24} "SPACE" IN INFANTS, CHILDREN, AND ADULTS. Anne Perley, Gilbert B. Forbes, and Miriam M. Pennoyer. J. Pediat. 38, 299-305(1951) Mar.

The volume of fluid through which radioactive Na^{24} is rapidly distributed has been measured in 37 infants and children and 19 adult males. The radioactive Na^{24}, in the form of the chloride, was injected intravenously, and a period of 1¾ to 4½ hr was allowed for distribution. In 11 premature infants the sodium space averaged 43.5% of the body weight, and in 16 newborn infants 35.2%. In 7 children from 1 to 14 yr of age, the value averaged 30.2%, and in 19 adult males 25.2%. The data indicate that the volume of fluid occupied by Na in relation to body weight declines as growth proceeds.

3633

Naval Radiological Defense Lab.
A QUANTITATIVE STUDY OF PERCUTANEOUS ABSORPTION; III. EFFECT OF CONCENTRATION AND SOLUBILITY ON TRACER ABSORPTION OF Sr^{89} FROM INTACT AND ABRADED SKIN AND FROM MUSCLE IN THE RAT; VALIDITY OF SURFACE COUNTER TECHNIQUES. (Technical Objective AW 6) R. Kenneth Loeffler. Feb. 12, 1951. 18p. (AD-290(B))

Absorption into the body of $Sr^{89}Cl_2$ in isotonic and saturated solutions of carrier $SrCl_2$ from intact and abraded rat skin was shown to be essentially independent of the concentration of the applied solution. Very little radiostrontium was found in the body 1 hr after poorly soluble $Sr^{89}SO_4$ was applied to intact skin, abraded skin, and intramuscular lacerations. However, an appreciable amount was found to have been absorbed ten days after intramuscular application. Values for percutaneous absorption obtained by surface-counting technique were shown to correlate closely with those obtained by direct analysis of ashed tissues. (auth)

CHEMISTRY

3634

Iowa State Coll.
THE SOLUBILITY, ACTIVITY COEFFICIENTS AND SOLUBILITY PRODUCT OF MANGANESE(II) IODATE. Anson Mack Hayes and Don S. Martin, Jr. May 1, 1951. 11p. (AECU-1289)

The solubilities of Mn(II) iodate in water at temperatures from 3 to 90°, in aqueous solutions of NaCl at 3 and 25°, and in aqueous solutions of KIO_3 and Mn(II) perchlorate at 25° were determined. Mean ionic activity coefficients have been calculated from the solubilities. The solubility product at 25° was 4.79×10^{-7} and the standard heat of solution was 2,280 cal/mole. (auth)

3635

Pennsylvania Univ.
THERMODYNAMIC STUDY OF IRON-OXYGEN-SULFUR SYSTEM; THIRD QUARTERLY REPORT. F. J. Dunkerley, J. L. Nichols, and V. V. Damiano. Apr. 15, 1951. 7p. (NYO-732)

Initial runs in the static system using induction heating gave evidence of an $Fe(g) + SO_2(g)$ reaction with concomitant precipitation of FeS and FeO on the colder portions of the system. Since FeO and FeS are continuously removed from the reaction $3Fe(g) + SO_2(g) = FeS + 2FeO$, equilibrium could not be attained. To eliminate this difficulty, a molybdenum-wound resistance furnace has been constructed in which the entire reaction chamber is at molten-iron temperatures, with the entering gas mixtures bubbled through the melt. The hydrogen-reduction method for analyzing the melt for total sulfur content has proved satisfactory. Work is being continued on the simultaneous determination of total oxygen by the same method. (auth)

3636

THE CHEMISTRY OF RUTHENIUM. PART III. THE REDOX POTENTIALS OF THE RUTHENIUM II COMPLEXES WITH SUBSTITUTED DERIVATIVES OF 2:2′ DIPYRIDYL AND o-PHENANTHROLINE. F. P. Dwyer. J. Proc. Roy. Soc. N. S. Wales 83, 134-7(1950) Sept. 6.

The redox potentials of the Ru(II) complexes with substituted derivatives of 2,2′ -dipyridyl and o-phenanthroline have been determined, and a redetermination of the potentials of the complexes with the parent bases has been made. Methyl groups in both bases depress the potential, whereas the potential of the complex with 5-bromo-o-phenanthroline is the highest of all. The Ru compounds thus follow the same trend as the ferrous compounds. At equivalent acid concentrations, the redox potentials of tris-o-phenanthroline Ru salts are always higher than of the tris-2,2′ -dipyridyl analogues. (auth)

3637

THE CHEMISTRY OF RUTHENIUM. PART IV. THE POTENTIAL OF THE QUADRIVALENT/TRIVALENT RUTHENIUM COUPLE IN HYDROCHLORIC AND HYDROBROMIC ACIDS. J. R. Backhouse and F. P. Dwyer. J. Proc. Roy. Soc. N. S. Wales 83, 138-45(1950) Sept. 6.

The potential of the quadrivalent/trivalent Ru couple has been studied in HCl and HBr solutions. From the shapes of the curves it is concluded that the system is cationic. The potential is depressed markedly by halide ions and to a lesser extent by H^+ ions. The results are consistent with the existence of hydrated cations of the type $(RuX(OH)_2)^+$ and $(RuX{\cdot}OH)^{++}$ for the oxidant and $(RuX_2)^+$ and $(RuX)^{++}$ for the reductant. The potentials for the chloro and bromo systems, respectively, extrapolated from the point where hydrolysis becomes serious to zero acid concentrations, are 0.96 ± 0.002 and 0.82 ± 0.002 volt. (auth)

3638

COAGULATION EFFECTS OF THORIUM NITRATE ON AQUEOUS SOLS OF SILVER HALIDES IN STATU NASCENDI. II. THE FACTORS OF STABILIZATION AND THE EFFECTS OF "AGING" OF THORIUM NITRATE SOLUTION. B. Težak, E. Matijević, and K. Schulz. J. Am. Chem. Soc. 73, 1605-9(1951) Apr. (See also NSA 5-2688)

The effect of various concentrations of $Th(NO_3)_4$ solution on the coagulation of AgBr sols in statu nascendi was investigated. For such sols various effects on the critical limits in the central stabilization region, the relations between the coagulation value of K_2SO_4 and the concentration of HBr or $Th(NO_3)_4$, the influence of the acidity of the media, and the effect of "aging" of the $Th(NO_3)_4$ aqueous solutions were observed. It was found that with decreasing concentration of HBr under constant concentration of $Th(NO_3)_4$ the coagulation value of sulfate ion decreases in a typical manner. The similar decrease of coagulation value was also found with decreasing concentration of $Th(NO_3)_4$ solution. By "aging" of the $Th(NO_3)_4$ solutions a characteristic shift of the stabilization-coagulation limit toward lower concentrations was found. The phenomena observed have been explained by the assumption that in aqueous solutions there exist Th complexes of different valencies which manifest themselves in typical coagulation values. Thus for negatively charged AgBr sol it was found that the coagulation value for bivalent complex is $\sim 4 \times 10^{-4}$ N; for trivalent, $\sim 3 \times 10^{-5}$ N; and for tetravalent, $\sim 3 \times 10^{-6}$ N of $Th(NO_3)_4$ solution. (auth)

3639

ELECTROMIGRATION IN A CATION EXCHANGE RESIN. K. S. Spiegler and C. D. Coryell. Science 113, 546-7(1951) May 11.

The exploration of the electrical conductance of ion-exchange resins and its dependence on the nature of the adsorbed ions suggest the study of electromigration in synthetic ion exchangers and the use of these resins for the separation of ions of different mobility. The movement of ions in a resin column was followed by use of Na^{22} as a radiotracer technique. The experiments prove that the adsorbed cations carry the current. Thus, although solid in the physical sense, from the point of view of electrical conductivity the wet resins act similarly to solutions of electrolytes, confirming the hypothesis advanced to explain equilibrium experiments (Bauman and Eichhorn, J. Am. Chem. Soc. 69, 2830(1947)) that the resin phase is equivalent to an ionized salt solution.

3640

Lewis Flight Propulsion Lab.
GENERAL METHOD FOR COMPUTATION OF EQUILIBRIUM COMPOSITION AND TEMPERATURE OF CHEMICAL REACTIONS. Vearl N. Huff and Virginia E. Morrell. June 1950. 47p. (NACA-TN-2113)

A rapidly convergent successive approximation process is described that simultaneously determines both composition and temperature resulting from a chemical reaction. This method is suitable for use with any set of reactants over the complete range of mixture ratios as long as the products of reaction are ideal gases. An approximate treatment of limited amounts of liquids and solids is also included. The process is applicable to a wide variety of problems that include (1) combustion at constant pressure or volume and (2) isentropic expansion to an assigned pressure, temperature, or Mach number. (auth)

3641

THE KINETICS OF HETEROGENEOUS EXCHANGE REACTIONS; trans. from Arkiv Kemi 20A, 1-26(1945). Karl-Erik Zimens; tr. by C. Feldman. 1945. 29p. (NP-2273)

A theoretical investigation has been made of the velocity of exchange reactions between a solid and a nonsolid phase governed by the following processes: (1) diffusion toward the solid through a layer of solution or the gas adhering to it, (2) chemical exchange at the phase boundary, (3) diffusion within the solid phase both toward and away from the phase boundary. Time laws for these processes in the case of reversible reactions are derived and discussed. A discussion is also given of the possibilities of distinguishing among these processes in order to find which is the rate-determining process, and to measure the corresponding parameters. The time laws derived provide the basis for an analytical treatment of heterogeneous exchange reactions.

3642

Naval Research Lab.
THE RING METHOD OF MEASURING SURFACE TENSION

FOR LIQUIDS OF HIGH DENSITY AND LOW SURFACE TENSION. H. W. Fox and C. H. Chrisman, Jr. Jan. 17, 1951. 10p. (NLR-3793)

The existing correction tables applicable to the measurement of surface tension by the ring method are not extensive enough to be used with liquids of high density coupled with low surface tension, as for example, the fluorocarbons. The convenience and rapidity of the ring method make it worthwhile to extend the tables to the region in question. The tables, therefore, have been extended by fitting a combined hyperbolic and linear equation to the curves derived from existing tables. This equation produces values in agreement with existing tables to better than 0.05%. The extrapolated tables were verified experimentally over their whole range by comparing measurements of the surface tensions of five fluorocarbon liquids made by the differential capillary-rise method (which is independent of corrections) with measurements on the same liquids made by the ring method. The agreement was as good as that associated with the original tables.

3643

ZIRCONIUM ALKOXIDES. D. C. Bradley and W. Wardlaw. J. Chem. Soc., 280-5(1951) Feb.

From the reaction between Na ethoxide and $ZrCl_4$ in ethyl alcohol a complex Na Zr ethoxide has been isolated, but its composition does not accord with the formula $NaH[Zr(OEt)_6]$ reported by Meerwein and Bersin, (Ann. 476, 113(1929)). Zr alkoxides have been prepared by treating solutions of $ZrCl_4$ in appropriate alcohols with anhydrous ammonia. The products are impure owing to hydrolysis which becomes very marked when secondary and tertiary alcohols are used. The cause of this hydrolysis is discussed. Ester-interchange has been successfully used for the preparation of various types of Zr alkoxide. Tentative views are advanced to account for the interesting variation of the volatilities of Zr alkoxides with structure of the alkyl group. (auth)

ANALYTICAL PROCEDURES

3644

[Ames Lab.]
AN INSTRUMENT FOR INTERNAL STANDARD FLAME PHOTOMETRY AND ITS APPLICATION TO THE DETERMINATION OF CALCIUM IN THE RARE EARTHS. Robert H. Heidel and Velmer A. Fassel. July 25, 1950. 11p. (ISC-107)

Details are given for simple modifications of a laboratory monochromator so that selected internal standard line pairs from flame spectra may be isolated and measured simultaneously with a multiplier phototube differential photometer. The basic design is applicable to most spectrometers or spectrographs. An atomizing system with provisions for sample recycling and recovery is also described. This equipment has been applied to the determination of Ca in the rare earths in the concentration range of 0.025 to 2.5%. Average deviation for a series of repeated determinations at various concentrations is about ±1.5%. (auth)

3645

Knolls Atomic Power Lab.
DETERMINATION OF SODIUM MONOXIDE IN SODIUM; reprint from Anal. Chem. 22, 1283-6(1950) Oct. Leonard P. Pepkowitz and William C. Judd. Oct. 1950. 4p. (KAPL-P-452)

A method is presented for the determination of NaO in Na. The basis of the procedure is the extraction of the metallic Na with Hg in a special apparatus effecting a quantitative separation from the NaO. The mean deviation obtained is ±0.005% O. A novel sampling procedure is described which is an integral part of the method. (auth)

3646

California Univ., Los Angeles
THE QUANTITATIVE MEASUREMENT OF EVANS BLUE (T-1824) AND ACID HEMATIN IN TISSUE HOMOGENATES. Raymond D. Goodman, Alvin E. Lewis, and Edward A. Schuck. Feb. 15, 1951. 9p. (UCLA-117)

A method is described for the extraction and measurement of T-1824 and the ethyl ester of acid hematin from rat tissue homogenates. The method consists of a chemical treatment of the homogenate followed by separation of the T-1824 and "acid hematin" based on selective solubility differences in water and ether, and the final measurement of each in a spectrophotometer. (auth)

3647

Radiation Lab., Univ. of California
DETECTION OF STEROIDS IN PAPER CHROMATOGRAPHY. David Kritchevsky and Martha R. Kirk. Mar. 26, 1951. 4p. (UCRL-1198)

The methods available for detection of steroids in paper chromatography have been summarized. 6 references.

3648

ANALYTICAL USE OF THE FORMATION OF THE BERYLLIUM-FLUORIDE COMPLEX. Fritz Feigl and A. Schaeffer. Anal. Chem. 23, 351-3(1951) Feb.

Be ions have such a great tendency to form stable complex BeF_4^{--} ions that Be nitrate solutions are able to dissolve insoluble fluorides and to demask reaction systems which are masked by fluoride. Be silicates and metallic Be are transformed into K fluoberyllate by fusing or sintering with KHF_2. These effects permit essential simplifications in gravimetric analysis of fluorspar and cryolite, and detection of phosphate, molybdate, tungstate, Fe, and Ti in presence of an excess of fluoride and of Be in minerals, ores, and alloys. (auth)

3649

POLAROGRAPHIC CHARACTERISTICS OF +2 AND +3 VANADIUM; II. POLAROGRAPHY IN COMPLEXING SOLUTIONS. James J. Lingane and Louis Meites. J. Am. Chem. Soc. 73, 2165-70(1951) May.

Data are presented on the half-wave potentials and diffusion current constants of the waves of +2 and +3 vanadium in benzoate, carbonate, citrate, cyanide, fluoride, phosphate, phthalate, pyridine, pyrophosphate, salicylate, tartrate, tetraborate, thiocyanate, and thiosulfate solutions. (auth)

3650

TITRIMETRIC DETERMINATION OF TITANIUM IN TITANIUM-RICH PREPARATIONS. Friedrich Bischoff. Z. anal. Chem. 130, No. 2/3, 195-200(1950). (In German)

A cheap, time-saving method for the volumetric analysis of Ti(IV) is described. The Ti is reduced to Ti(III) by Fe powder or wire in a CO_2 atmosphere, the Ti(III) then being titrated with 0.1N $Fe_2(SO_4)_3$ solution, with KCNS as indicator.

CRYSTALLOGRAPHY AND CRYSTAL STRUCTURE

3651

Knolls Atomic Power Lab.
NOTE ON THE STRUCTURE OF URANIUM; reprint from Acta Cryst. 2, Part 6, 420(1949) Dec. Joseph S. Lukesh. Sept. 1949. 1p. (KAPL-P-232)

This report was issued and indexed as AECU-398, which appeared in its entirety in Nuclear Science Abstracts as NSA 3-1351.

3652

AN IMPROVED DEVICE FOR X-RAY DIFFRACTION STUDIES AT LOW TEMPERATURES. Benjamin Post, Robert S. Schwartz, and I. Fankuchen. Rev. Sci. Instruments 22, 218-19(1951) Mar. (Laboratory and shop note)

Brief note is made of a simple device for growing and orienting single crystals of substances which are liquids or gases at room temperatures, for x-ray investigations down to the temperature of liquid N_2.

DEUTERIUM AND DEUTERIUM COMPOUNDS

3653

EXCHANGE OF DEUTERIUM OXIDE WITH BROMODICHLOROMETHANE AND CHLORODIBROMOMETHANE. R. H. Sherman and R. B. Bernstein. J. Am. Chem. Soc. 73, 1376-7(1951) Mar. (Note)

Bromodichloromethane-d and chlorodibromomethane-d have been obtained by the exchange reaction between the protium analogs and D_2O in the presence of OD^- ion. The reactions were carried out in heavy-walled pyrex vessels of about 30-ml volume, into which were placed 0.1 mole of purified halomethane, 0.1 mole of 98% D_2O and 0.01 mole of NaOD. After outgassing the contents at −78°C, the vessel was sealed and maintained at 105°C in the absence of light for 4 days, with periodic shaking. The reactor was then cooled to −195°C and opened. The nonaqueous layer was dried and distilled through a small packed column. The infrared adsorption spectra of the purified products revealed appropriate bands attributed to the C−D bond stretching and bending vibrations. A determination of the isotopic purity of the deuterohalomethanes was carried out on the basis of the 3020 cm^{-1} band of the C−H bond. The results were 43% CBr_2ClD and 16% CCl_2BrD. Upon recharging the reactor with the enriched compound and a new supply of D_2O and NaOD in the original proportions the exchange reactions were repeated under similar conditions, resulting in 64% CBr_2ClD and 36% CCl_2BrD, respectively. Results indicate that the rate of exchange of bromodichloromethane and chlorodibromomethane is more rapid than the rate of hydrolysis, in agreement with the previous data for chloroform. However, the apparent order of reactivity toward exchange for these two compounds is somewhat surprising from a point of view of electronegativity. Further kinetic studies in a single-phase system appear necessary for an understanding of this observation.

FLUORINE AND FLUORINE COMPOUNDS

3654

Carbide and Carbon Chemicals Div., UCC, K-25
REACTIONS OF POLYFLUORO OLEFINS; IV. CHEMICAL PROPERTIES OF ANIONIC ADDITION PRODUCTS. Karl E. Rapp, John T. Barr, Roy L. Preutt, and Carl T. Bahner. Mar. 26, 1951. 21p. (K-728)

A variety of chemical reactions which normally involve the functional linkages of organic sulfides, ethers, and amines were investigated using the products of anionic addition of thiols, alcohols, and amines to polyfluoro olefins. The results of these reactions (in a number of cases negative) established the strong influence exerted by fluorine upon neighboring functional groups of organic, fluorine-containing compounds. Thus, the theory is presented that fluorine, in transmitting an extremely electronegative force through the C−F covalent bond, so distorts the electronic field of a neighboring functional group that chemical reaction involving the electrons of this group is virtually prevented except under the most rigorous conditions; and, conversely, the less electronegative nature the central atom of a functional group possesses the less resistance it offers to field distortion allowing the adjacent C−F bonds to become more polar, less covalent, and more susceptible to chemical attack. (auth)

3655

AROMATIC FLUORINE COMPOUNDS; II. 1,2,4,5-TETRAFLUOROBENZENE AND RELATED COMPOUNDS. G. C. Finger, F. H. Reed, D. M. Burness, D. M. Fort, and R. R. Blough. J. Am. Chem. Soc. 73, 145-9(1951) Jan.

The synthesis and properties of 1,2,4,5-tetrafluorobenzene and a group of bromofluoro and chlorofluorobenzenes with a predominating 1,2,4,5 structure are described. Flash-point and surface-tension data for the fluorinated benzenes and the influence of chlorine substitution upon these values were studied. Under nitration conditions, 1,2,4,5-tetrafluorobenzene will not form a nitro derivative, but will undergo a preferential 1,4-fluorine displacement-oxidation mechanism to give 2,5-difluoro-1,4-benzoquinone. Diazotization reactions on 2-nitro-3,4,6-trifluoroaniline reveal that the nitro group or a F atom in the 4 or 6 position may become labilized under certain conditions, and undergo replacement. (auth)

3656

AROMATIC FLUORINE COMPOUNDS; IV. 1,2,3,5-TETRAFLUOROBENZENE. G. C. Finger, F. H. Reed, and R. E. Oesterling. J. Am. Chem. Soc. 73, 152-3(1951) Jan.

The preparation of 1,2,3,5-tetrafluorobenzene and some of its intermediates is described. Cuprous oxide as a catalyst was used to advantage in the hypophosphorous acid deamination method. (auth)

3657

AROMATIC FLUORINE COMPOUNDS; V. 1,3,5-TRIFLUOROBENZENE. G. C. Finger, F. H. Reed, and J. L. Finnerty. J. Am. Chem. Soc. 73, 153-5(1951) Jan.

The synthesis and properties of 1,3,5-trifluorobenzene, its intermediates, and some of its derivatives are described. (auth)

GRAPHITE

3658

Argonne National Lab.
THE PROPERTIES OF THE INTERSTITIAL COMPOUNDS OF GRAPHITE; I. THE ELECTRONIC STRUCTURE OF GRAPHITE BISULPHATE. Gerhart Heanig. Feb. 15, 1951. 25p. (ANL-4579)

The electrical resistance, its temperature dependence, and the Hall coefficients of graphite bisulfate compounds have been determined at various oxidation stages. The measurements have indicated that the oxidation removes electrons from a nearly full conduction band. Reduction of the lamellar bisulfate compounds produces residue compounds which retain about a third of the bisulfate ions and half the sulfuric acid originally present in the lamellar compounds. The formula of the residue compounds is approximated by $C_n.HSO_4.4H_2SO_4$. The model of a hypothetical graphite which has lost electrons from its conduction band is approximated closely by these residue compounds, since the impurities are distributed in a state of high disorder. The lamellar compounds, on the other hand, may distort the band structure of graphite because they form a superlattice. (auth)

3659

Knolls Atomic Power Lab.
ON THE SYMMETRY OF GRAPHITE; reprint from Phys. Rev. 80, 226-9(1950) Oct. 15. Joseph S. Lukesh. Oct. 15, 1950. 4p. (KAPL-P-454)

An abstract of this report appeared in Nuclear Science Abstracts as NSA 5-63.

3660

North American Aviation, Inc.
THE MODULUS OF RIGIDITY OF AUF AND SA-25 GRAPHITE FROM ROOM TEMPERATURE TO 2000°C. F. E. Faris and C. A. Smith. Mar. 5, 1951. 23p. (NAA-SR-108)

The modulus of rigidity and Young's modulus of SA-25 graphite and AUF graphite have been determined by a static method at room temperature. The average room temperature moduli are 3.07×10^{10} dynes/cm^2 for AUF cut parallel to the extrusion direction, 2.41×10^{10} dynes/cm^2 for AUF cut radially, and 3.27×10^{10} dynes/cm^2 for SA-25. Poisson's ratio and the bulk modulus for SA-25 graphite have been calculated for the data. The average room-temperature values are 0.27 for the ratio and 6×10^{10} dynes/cm^2 for the modulus. The variation of the modulus of rigidity with temperature has been obtained in the range 25 to 2000°C by using graphite samples as suspensions for a torsion pendulum. The samples were heated by a furnace containing a helical graphite heating element. The samples all showed an increase in modulus with increasing temperature to a maximum value about 30% greater than that at room temperature. The maximum occurred near 1750°C for both cuts of AUF graphite and near 1550°C for SA-25. The internal friction was observed to increase rapidly with temperature after the maximum in the modulus had been reached. It is suggested that the decrease in the modulus at high temperatures may result from grain-boundary slip. (auth)

3661

GRAPHITIZABLE AND NONGRAPHITIZABLE CARBONS. Rosalind E. Franklin. Compt. rend. 232, 232-4(1951) Jan. 15. (In French)

A clear distinction is shown by x-ray-diffraction studies between graphitizable carbons, such as petroleum, tar, and coal cokes, and the residue of pyrolysis of polyvinyl chloride, which on heating between 1000 and 3000°C show a progressive transformation toward the structure of graphite, and nongraphitizable carbons such as the charcoals of sugar and coals rich in oxygen and residue of polyvinylidene chloride, which do not show such a trend. This difference is attributed to the greater porosity of the latter, which permits the formation of a rigid structure at low temperature (below 500°C) and prevents further transformation.

RADIATION EFFECTS

3662

Chicago Univ.
THE HOT ATOM CHEMISTRY OF THE PROPYL BROMIDES. (dissertation) Maurice S. Fox. Mar. 1951. 56p. (AECU-1285)

An extensive series of bombardments of propyl bromide with neutrons generated by the deuteron beam impinging on a Be target has been made. The principal results are tabulated. The fraction of the Br^{80} radioactivity produced by the irradiation of propyl bromide material under various conditions is shown. Analysis into the separate organic products is given. The most striking feature of the results is the tremendous effect of solidification on the retention of radiobromine. There appears to be very little effect of temperature above and below the melting point and almost the entire retention occurs just at the melting point. A second point of major interest is the extensive production of high boiling organic bromide in the solid phase at low temperatures, believed to be dibrom butanes, pentanes, and hexanes.

3663

THE EFFECT OF HIGH ENERGY RADIATION ON THE ABSORPTION AND LUMINESCENCE OF GLASSES AND

CRYSTALS. J. H. Schulman, R. J. Ginther, C. C. Klick, and E. W. Claffy. Paper presented at the 53rd Annual Meeting of the American Ceramic Society, Chicago, Apr. 24, 1951.

An abstract of this paper appeared in Am. Ceram. Soc. Bull. 30, 97(1951) Mar. and is reproduced here in its entirety.

The absorption of radiant energy by matter can result in dissipation of the absorbed energy as heat, in reradiation of the absorbed energy as luminescence, or in production of photochemical changes in the absorbing material. The occurrence of photochemical changes on irradiation of a solid is most frequently manifested by a change in its absorption spectrum. A number of crystals and glasses are of particular interest in that they undergo photochemical changes on exposure to high-energy radiation that alter not only their absorption spectra but their luminescent properties as well. The behavior of a number of such crystalline and glassy systems is described, and an interpretation of the phenomenon is proposed for some of the simpler cases.

RARE EARTHS AND RARE-EARTH COMPOUNDS

3664

ISOTOPIC SHIFT IN THE SPECTRUM OF CERIUM. Peter Brix and Helmut Frank. Z. Physik 127, 289-96(1950) Jan. 21. (In German)

Transitions $4f^26s - 4f^26p$ of Ce(II), occurring between 4450 and 4750 A, exhibit an isotopic shift $Ce^{140} - Ce^{142}$ averaging 54×10^{-3} cm^{-1}; the shift of Ce^{142} lines is toward the red. This value shows that the isotopic effect increases from Ba to Ce by a factor of 2, a fact that seems to reflect the influence of the magic number 82. (auth)

3665

JOINT MEETING OF THE HARZ CHAPTER OF THE GESELLSCHAFT DEUTSCHER CHEMIKER, THE BERGAKADEMIE CLAUSTHAL, AND THE GMELIN-INSTITUT (CLAUSTHAL, GERMANY, MAY 9, 1950). Angew. Chem. 62, 413-14(1950) Sept. 7. (In German)

The following were among the reports presented at the meeting and summarized herein: Some Facts Concerning the Chemistry of Rare Earths, by W. Fischer (mainly on the separation from Y); On the Preparation of Carbides of Rare Earths, by H. Hartmann.

3666

THE MECHANISM OF ESTABLISHMENT OF THE REDOX POTENTIAL OF Ce^{+4}/Ce^{+3} ON PLATINUM. Klaus J. Vetter. Z. physik. Chem. 196, 360-77(1951) Feb. (In German)

As a part of a study of the establishment of redox potentials (the latest work cited having been published in Z. physik. Chem. 195, 337(1950)), the pair Ce^{+4}/Ce^{+3} was investigated using mostly 1N H_2SO_4 as an electrolyte and Pt for electrodes. The simple reaction $Ce^{+4} + e^- \rightleftarrows Ce^{+3}$ is probably the one involved. An equation is given for the calculation of polarization values. Different values of the potential were obtained when H_2SO_4 was replaced by HNO_3 or when various electrolytes were added to H_2SO_4; this is explained by the formation of complexes or by hydrolysis.

SEPARATION PROCEDURES

3667

Oak Ridge National Lab.
RATES OF ION EXCHANGE IN NON-AQUEOUS MEDIA. Franklin S. Chance, Jr. Mar. 19, 1951. 57p. (ORNL-957)

Two cation exchangers, a weak acid type (Amberlite IRC-50) and a strong acid type (Dowex 50), have been used in column operation to remove Na from a solution of 0.1M NaOH in various solvents composed of methanol, benzene, acetone, and ethylene glycol singly or in binary combinations. Similarly, three anion exchangers, a weak-base (Amberlite IR-45) and two strong-base (Dowex A-2 and Amberlite IRA-400), have been used to remove the Br from 0.05M HBr in various solvents composed of methanol, tert-butanol, ethylene glycol, ethyl acetate, dioxane, benzene, acetone, and CCl_4 singly or in binary mixtures. Conclusions as to rate of exchange, influence of solvent on resin, and feasibility for a process solution are drawn.

3668

Radiation Lab., Univ. of California
CARRIER-FREE RADIOISOTOPES FROM CYCLOTRON TARGETS; XVI. PREPARATION AND ISOLATION OF Pd^{103} FROM RHODIUM. Jeanne D. Gile, Herman R. H Haymond, Warren M. Garrison, and Joseph G. Hamilton. Feb. 19, 1951. 2p. (UCRL-1144)

The report is reproduced here in its entirety.

The 17-day Pd^{103} was prepared from Rh by the nuclear reaction $Rh^{103}(d,2n)Pd^{103}$ using the 20-Mev deuteron beam of the 60-in. cyclotron at the Crocker Laboratory. In the procedure described below, the Pd^{103} is isolated in the carrier-free state from the target element and from the 41-day Ru^{103} which is produced concurrently in low yield by the (n,p) reaction. "Palladium-free" Rh foil, 20 mil thick, was clamped to a water-cooled Al target plate and bombarded for a total of 155 μa-hr at an average beam intensity of 10 μa. The bombarded Rh metal (approx. 1 g) was fused with excess potassium acid sulfate and the resultant mass was leached with water. A small amount of insoluble material which did not carry activity was removed by centrifugation. The supernatant solution was made 6N in HCl by the addition of appropriate amounts of 12N HCl and NaCl. Five Mg of Se as selenous acid was added, and the solution was saturated with SO_2. The resultant precipitate of elemental Se which carried over 99% of the Pd^{103}, was separated from solution by centrifugation, washed with water, dissolved, and reprecipitated. The final Se precipitate containing the Pd^{103} was dissolved in 36N H_2SO_4, transferred to an all-glass distilling flask and distilled at 200°C with the addition of 9N HBr. The residue which contained all of the Pd^{103} activity was evaporated to dryness on 40 mg of sodium sulfate. The activity dissolved quantitatively in 5 ml of water. The activity was followed for 80 days and showed only the assigned 17-day half-life. The x radiation had a half-thickness in Al of 200 mg/cm^2 which agrees closely with the previously observed value. The activity was further identified by chemical separation through the use of added Pd, Rh, and Ru carriers.

3669

THE HYDRATION OF THENOYLTRIFLUOROACETONE IN BENZENE SOLUTION. Edward L. King and William H. Reas. J. Am. Chem. Soc. 73, 1806-8(1951) Apr.

This work is an investigation of the formation of the hydrate of thenoyltrifluoroacetone (TTA) and in particular its stability in benzene solution. In a benzene solution in equilibrium with an aqueous solution 11% of the TTA is present as a hydrate. This has been shown by a study of the solubility of water in benzene solutions of TTA. The rate of the enol $\rightleftharpoons$ hydrate reaction in benzene solution is low. This leads to curious phenomena in experiments in which the distribution of TTA between aqueous and benzene phases is studied at short time intervals. The rapidly established distribution coefficients to be expected have been calculated and agree with those observed. The phenomena observed in this work is of importance in studies of the rate of metal ion chelate distribution. (auth)

SPECTROSCOPY

3670

Knolls Atomic Power Lab.
SPECTROSCOPIC ANALYSIS OF DEUTERIUM IN HYDROGEN-DEUTERIUM MIXTURES. H. P. Broida and J. W. Moyer. Apr. 2, 1951. 42p. (KAPL-502)

A method for the analysis of relative concentrations of H isotopes has been devised which employs optical spectroscopy. Hydrogen-deuterium mixtures containing from 85 to 100% deuterium have been rapidly analyzed to within 0.1% of the major component using a 150-Mc discharge in flowing gas. Under typical conditions the value of the measured intensity ratio varied with pressure in an unexplained manner.

SYNTHESES

3671

THE SYNTHESIS OF ETHYL ACETAMIDOCYANOACETATE, dl-LYSINE, dl-ORNITHINE AND dl-TYROSINE LABELED WITH ISOTOPIC CARBON. Melvin Fields, Doris E. Walz, and Seymour Rothchild. J. Am. Chem. Soc. 73, 1000-2 (1951) Mar.

The reductive acetylation of ethyl isonitrosocyanoacetate has been achieved in excellent yield by selective catalytic hydrogenation. New syntheses of dl-lysine, dl-ornithine, and dl-tyrosine have been devised and utilized for the preparation of these compounds labeled with C^{14}.

TRACER APPLICATIONS

3672

Brookhaven National Lab.
QUINONE-HYDROQUINONE EXCHANGE REACTIONS; I. NONEXCHANGE IN DUROQUINHYDRONE. Aksel A. Bothner-By. [nd] 9p. (AECU-1297)

Quinhydrone complexes have been prepared from duroquinone and durohydroquinone, one compound being labeled with C^{14}. Thermal decomposition in vacuo yielded the original compounds, no exchange of radioactive isotope having taken place after complex formation. The formulation of quinhydrones as symmetrical resonance hybrids is thus disproved. 16 references. (auth)

ENGINEERING

3673

Oak Ridge National Lab., Y-12 Area
MEANS FOR MAKING UNIFORM CIRCULAR HELIARC WELDS BY DEFLECTING THE ION BEAM CONTINUOUSLY. E. R. Mann. Apr. 9, 1951. 11p. (ANP-63)

A technique is proposed for welding circular members of an assembly requiring many proximate welds. In order to ensure that the welds will be identical and to prevent stresses caused from the heat treatment of neighboring metal, it is proposed that the welding be done with the entire assembly heated in an inert atmosphere almost to the melting point. By proposed methods, the ion beam is made to move around the circular weld path with extremely high speeds bringing the temperature of points on the circle up uniformiy until the weld is complete all the way around at the same time.

HEAT TRANSFER AND FLUID FLOW

3674

Aircraft Engine Research Lab., National Advisory Committee for Aeronautics
ADDITION OF HEAT TO A COMPRESSIBLE FLUID IN MOTION. Bruce L. Hicks. [nd] 15p. (NACA-ACR-E5A29)

Nature of nonadiabatic, frictionless, steady flow of a compressible fluid in a pipe of constant cross section is summarized; flow conditions can most conveniently be described in terms of the local Mach number M; steady flow cannot occur when heat is being added to the fluid at a point where its velocity equals the local velocity of sound (M = 1), and maximum temperature of the fluid occurs at $M = 1/\sqrt{\gamma}$ where γ is the ratio of specific heats; these results illustrated by application to high-speed flow through combustion chambers.

3675

THE FOUNDATION OF THE QUANTIZATION OF TURBULENCE. Ken-ichi Kusukawa. J. Phys. Soc. Japan 6, 86-9(1951) Mar.-Apr.

A theoretical explanation of the physical meaning of the quantization of turbulence in fluid flow is presented. A theory presented previously (J. Phys. Soc. Japan 5, 412-16 (1950)) in a paper on quantum-theoretical methods applied to turbulence in developed more strictly.

3676

Naval Ordnance Lab.
ON TURBULENT FLUID MOTION. (Aeroballistic Research Report No. 8). Max M. Munk. Nov. 9, 1950. 20p. (NAVORD-1572)

The tendency of fluids to move in turbulent fashion is traced back qualitatively to kinematics and simple dynamics. It is demonstrated that vortices cumulate discriminatively; i.e., only those vortices that turn corotationally with the general fluid motion cluster together. This tendency leads to increase of energy supply, and thus a foundation for generation and for maintenance of turbulence is laid. (auth)

3677

Massachusetts Inst. of Tech.
STATEMENT OF PROGRESS FOR THE PERIOD 1 MARCH 1951 TO 1 APRIL 1951. John A. Clark. Apr. 1, 1951. 6p. (NP-3056)

Low-velocity boiling and nonboiling heat-transfer data have been obtained at 1500 psia for water velocities of approximately 0.02 and 1.40 fps, and at 500 psia at velocities of 0.56 and 1.2 to 1.4 fps. Results are shown graphically.

3678

New York Univ.
TWO-DIMENSIONAL SUBSONIC COMPRESSIBLE FLOWS PAST ARBITRARY BODIES BY THE VARIATIONAL METHOD. Chi-Teh Wang. Mar. 1951. 73p. (NACA-TN-2326)

A variational method has been used to obtain an approximate solution of the nonlinear differential equation which governs compressible flow. The general problem of steady irrotational flow past an arbitrary body is formulated. Two examples were carried out, namely, the flow past a circular cylinder and the flow past a thin curved surface. The variational method yields results of velocity and pressure distributions which compare excellently with those found by existing methods. These results indicate that the variational method will yield good approximate solution for flow past both thick and thin bodies, at both high and low Mach numbers.

VACUUM SYSTEM

3679

Knolls Atomic Power Lab.
REPORT ON STATIC SEAL TEST. Walter A. Heywood. Mar. 26, 1951. 23p. (KAPL-501)

This report also carries the number AECD-3081 and was abstracted in Nuclear Science Abstracts under that number as NSA 5-3139.

3680

Research Lab. of Electronics, Mass. Inst. of Tech.
IONIZATION GAGE STUDIES, p.6-8 of QUARTERLY PROGRESS REPORT [TWENTIETH, FOR THREE-MONTH PERIOD ENDING DECEMBER 1, 1950]. W. B. Nottingham and L. Sprague. Jan. 15, 1951. 3p. (NP-1947(p.6-8))

A new vacuum gage designed to eliminate the "reverse photoelectric effect" and which is easier to build than the Bayard gage is illustrated. Although present models show a sensitivity equal to that of a good Bayard gage (10^{-10} mm) the new instrument has no obvious limitations as regards the minimum pressure at which it can be used. A new type of ion flash from W filaments is reported and tentatively assigned to the presence of Na.

MINERALOGY, METALLURGY, AND CERAMICS

CERAMICS AND REFRACTORIES

3681

CERMETS VI: A PRELIMINARY STUDY OF THE OXIDATION AND PHYSICAL PROPERTIES OF TiC BASE CERMETS. C. C. McBride, H. M. Greenhouse, and T. S. Shevlin. Paper presented at the 53rd Annual Meeting of the American Ceramic Society, Chicago, Apr. 25, 1951.

An abstract of this paper appeared in Am. Ceram. Soc. Bull. 30, 103(1951) Mar. and is reproduced here in its entirety.

The TiC-base cermets investigated contained either Cr, Fe, Co, Ni, NiAl, ferrosilicon, or Duriron as the metallic constituent. They were evaluated on the basis of strengths at 75 and 1800°F, oxidation resistance at 2000°F, and the degree of chemical reaction between the carbide and metal as determined metallographically. Metallographic and x-ray studies were conducted on the oxide films to determine a qualitative mechanism of oxidation. Results of these studies showed TiC plus NiAl to be the most promising composition and oxygen diffusion to be the governing factor in the oxidation mechanism.

3682

THE OXIDATION OF HOT-PRESSED TITANIUM CARBIDE CONTAINING SMALL ADDITIONS. R. E. Wilson, G. A. Jones, and J. R. Tinklepaugh. Paper presented at the 53rd Annual Meeting of the American Ceramic Society, Chicago, Apr. 25, 1951.

An abstract of this paper appeared in Am. Ceram. Soc. Bull. 30, 103(1951) Mar. and is reproduced here in its entirety.

Oxidation-weight-gain data obtained by use of an automatic-recording balance are given for the oxidation of hot-pressed TiC containing small additions of Si, FeMnSi, Cr, Cr_2O_3, MoSi, TiN, and Mo. The oxidation-weight-gain curves of TiC-base cermets and SiC-base materials are included for comparison purposes. Photomicrographs of the microstructure of the hot-pressed carbides and oxide layers are used to illustrate the relationship between oxide layer and oxidation rate in TiC.

3683

Alfred Univ.
PERIODIC STATUS REPORT NO. 25; FUNDAMENTAL PROPERTIES OF METAL-CERAMIC MIXTURES AT HIGH TEMPERATURES; PROGRESS DURING PERIOD FEBRUARY 1 TO MARCH 31, 1951. W. B. Crandall and W. G. Lawrence. Mar. 31, 1951. 8p. (NP-3044)

Oxidation resistance studies have been completed on three-component systems consisting of 40% oxide (Al_2O_3 or MgO), 40% metalloid (SiN, TiN, SiC, ZrC, ZrB_2, CrB_2, or TiB_2), and 20% intermetallic (Cr – Al, Mo – Al, or Ni – Al). Those mixtures containing SiN and SiC were found to have the best oxidation resistance. Further work on thermal-shock-resistance theory has indicated that the nature of failure obtained on heating is much more complex than that during cooling. Consequently, it is the heating cycle that offers the greatest possibilities experimentally to prove or disprove the over-all theory. Thermal-expansion measurements were made on the high-temperature stable systems MgO (single crystal), ZrB_2, SiN (70% porous), Durhy, Cr–Al, and 40% MgO – 40% Sic – 20% Ni–Al after the dilatometer photocell amplifier had been recalibrated. Thermal diffusivity data at 900°C were obtained on CrB_2 (14% porous), SiN (80% porous), and Cr–Al (8% porous) using an improved method of obtaining the experimental heat curve.

3684

STABILIZATION OF ZIRCONIA WITH CALCIA AND MAGNESIA. Pol Duwez, Francis Odell, and F. H. Brown, Jr. Paper presented at the 53rd Annual Meeting of the American Ceramic Society, Chicago, Apr. 24, 1951.

An abstract of this paper appeared in Am. Ceram. Soc. Bull. 30, 89(1951) Mar. and is reproduced here in its entirety.

The minimum amount of calcia or magnesia required to stabilize zirconia into the cubic form is about 16 mole %. X-ray-diffraction studies show that both calcia and magnesia are in solid solution in cubic zirconia. This solid-solution phase extends from 16 to 30 mole % in the case of calcia and from 16 to 25 mole % in the case of magnesia. These results are for specimens cooled from 2000°C. After heating at various temperatures between 815 and 1375°C, the calcia-stabilized zirconia remains cubic, whereas the magnesia-stabilized zirconia reverts to the monoclinic form. On the basis of the results obtained from x-ray-diffraction and dilatometric measurements, information was obtained on the phase relationships in the zirconia–calcia and the zirconia–magnesia systems, and some modifications to the previously published phase diagrams of these systems are proposed.

3685

A STUDY OF THE PHASE RELATIONS OF $ZrO_2 - TiO_2$ AND $ZrO_2 - TiO_2 - SiO_2$. H. G. Sowman and A. I. Andrews. Paper presented at the 53rd Annual Meeting of the American Ceramic Society, Chicago, Apr. 25, 1951.

An abstract of this paper appeared in Am. Ceram. Soc. Bull. 30, 91(1951) Mar. and is reproduced here in its entirety.

The phase relations of the systems $ZrO_2 - TiO_2 - SiO_2$ were investigated. X-ray-diffraction techniques served as the principal means of analysis. Sufficient data were obtained in the study of the $ZrO_2 - TiO_2$ system to make it possible to diagram a major portion of its phase relations. A preliminary investigation of the ternary system $ZrO_2 - TiO_2 - SiO_2$, although not extensive, resulted in a better understanding of this system with an approximate location of some of its phase boundaries.

METALS AND METALLURGY

3686

Massachussetts Inst. of Tech. Engineering Practice School
SPECIFIC HEAT AND ENTHALPY OF LIQUID LITHIUM IN THE RANGE OF 500° C TO 1000° C. A. G. Bates and D. J. Smith. Mar. 28, 1951. 31p. (K-729)

A type-316 stainless-steel capsule containing a Li sample was heated to temperature in a vertical 2-in. furnace and then dropped into a Bunsen ice calorimeter. The specific heat of liquid Li in the desired temperature range was found to be 0.962 cal/g °C. The 95% confidence limits on this number are ±0.050 cal/g °C, which is a measure of precision only, not accuracy. The enthalpy of liquid Li above 0°C follows the equation $H_t - H_0 = 121(\pm 39) + 0.962(\pm 0.050)T$ cal/g for the same temperature range. The terms in parentheses are the 95% confidence limits on the constants. Six check runs were made with Ni capsules. (auth)

3687

Knolls Atomic Power Lab.
PREPARATION OF DUCTILE VANADIUM BY CALCIUM REDUCTION. Reprint from J. Electrochem. Soc. 97, 311-15(1950) Oct. R. K. McKechnie and A. U. Seybolt. Oct. 1950. 5p. (KAPL-P-451)

A method is described for preparing ductile V of about 99.5% purity by Ca reduction of V_2O_5. On the scale investigated, metal so reduced collects in a solid regulus weighing about 100 g and can be cold-worked directly from the button

to thin foils without annealing. O_2 is the principal cause of embrittlement in V produced by this technique. (auth)

3688

NEPA Div.
INVESTIGATION OF SOME METAL-CERAMIC COMBINATIONS AS COATING MATERIALS. W. A. Scholes. Mar. 6, 1951. 10p. (NEPA-1790)

The compositions under consideration comprised combinations of the metals Ti, Zr, and Nb with the oxides of Al, Be, Ca, Mg, Si, Ti, and Zr. After thermal treatment to induce reaction between the components, the specimens were subjected to x-ray and metallographic examination to determine the reaction products. Two systems, Ti – ZrO_2 and Zr – ZrO_2, showed positive evidence of solid solution. No interpretable evidence of reaction between metals and oxides was found in the other metal-ceramic combinations investigated. The systems in which definite reactions occurred are not oxidation resistant, and are consequently of inferior value as coatings. (auth)

3689

American Smelting and Refining Co.
PROGRESS REPORT NO. 3; DECEMBER 16, 1950 – MARCH 15, 1951. J. L. Everhart and E. L. Van Nuis. Sept. 20, 1950. 16p. (NYO-762)

Determination of Viscosity. A pyrex capillary viscometer which was constructed to determine the viscosities at moderate temperatures of low-melting alloys of Bi, In, Pb, Sn, and Tl is illustrated. Viscosities relative to mercury are reported on 12 alloys at temperatures approximately 10°C above the freezing point, at 100°C for those alloys freezing below that temperature, and at 150°C. The Bi–Pb eutectic alloy had the highest viscosity. The Bi–In eutectic alloy, lowest of the group, was approximately 30% less viscous than the Bi-Pb alloy. In general, the high-indium alloys were less viscous than the high-bismuth alloys. Corrosion Investigations. Results are reported of static corrosion tests at 1200°F for 500 hr of types 304, 309, 310, 317, 420, 446, and 502 stainless steels, low-carbon steel, and Kanthal A1, N155, and Hastelloy 21 alloys in contact with Bi–In–Pb–Sn or Bi–In–Sn liquid alloys and of dynamic tests (slow circulation for 1000 hr at 900 and 1200°F) on types 304, 310, and 446 stainless steels and 4% Cr–Ti in contact with Bi–Pb, Bi–Pb–Sn, or Bi–In–Pb liquids. An appendix describes the failure of a type 309 stainless-steel harp containing Bi–In–Pb eutectic at 1200°F after 1000 hr of operation.

3690

General Electric Research Lab.
DEVELOPMENT OF ZIRCONIUM BASE ALLOYS; SEVENTH QUARTERLY REPORT. (Progress Report Number 8). J. D. Nisbet. Apr. 5, 1951. 6p. (SO-2502; RL-535)

Problems in the control of variables affecting the arc-melting, continuous-casting equipment are discussed briefly, and modifications are proposed. A new "creep capsule" design for the creep rupture-testing equipment is illustrated. Photographs of results of steam-corrosion tests on samples of Zr alloyed with various additions of Nb and Ta are presented, but no data are given.

3691

Carnegie Inst. of Tech.
CREEP OF LEAD AT VARIOUS TEMPERATURES. Peter W. Neurath and J. S. Koehler. Mar. 1951. 32p. (NACA-TN-2322)

An investigation has been conducted on single crystals of Pb and on crystals of Cu and Zn to determine the creep properties for a wide range of temperatures. The apparatus used in the preparation and testing of the specimens is described in detail. The results are presented in the form of tables and in charts of strain against time at different stresses for the different specimens. (auth)

3692

A LITHIUM TUNGSTEN BRONZE OF PEROVSKITE TYPE. Arne Magnéli and Robert Nilsson. Acta Chem. Scand. 4, No. 2, 398(1950). (Short communication)

The compound has been synthesized in two different ways: (a) according to the method introduced by Brunner (Dissertation, Zurich (1903)) by heating mixtures of Li tungstate, W trioxide, and W dioxide in vacuum at about 850°C, and (b) by cathodic reduction of fused acid Li tungstate as was first done by Stavenhagen (Ber. 32, 3064(1899)). This Li bronze is evidently isomorphous with the cubic Na–W bronze, Na_xWO_3. The length of the cube edge, being about 3.72 A, is slightly different for various preparations, probably owing to the Li content of the compound not being constant. The formula may thus be written Li_xWO_3.

3693

Aeronautical Materials Lab., Naval Air Experimental Station, Philadelphia
REPORT ON INVESTIGATION OF THE CORROSION RESISTANCE OF TITANIUM AND TITANIUM ALLOYS. J. H. James. Feb. 23, 1950. 24p. (AML-NAM-AE-411033 Pt.I)

Solution potentials of Ti and surface-treated Ti, over a 24-hr immersion period, were measured. Dissimilar-metal couple tests were conducted in NaCl solution. Dissimilar-metal couples of Ti with Zn, zinc-anozine treated, Cd– and Cd–tin–alloy–plated steel were each subjected to salt spray, humidity, and atmospheric exposure. The adhesion of paint to anodized and unanodized Ti was compared.

3694

A REVIEW OF BERYLLIUM AND BERYLLIUM ALLOYS. John T. Richards. J. Metals (N.Y.) 3, 379-86(1951) May.

A summary of physical and metallurgical experiments on Be and numerous alloys and brief statements of the purpose and results of many of them are presented. Included are 7

tables of properties of Be alloys and a list of 91 articles for reference.

3695

Cryogenic Lab., Ohio State Univ.
THE VAPOR PRESSURE OF INORGANIC SUBSTANCES; VI. VANADIUM BETWEEN 1666°K AND 1882°K. [8th Technical Report]. James W. Edwards, Herrick L. Johnston, Paul E. Blackburn. Mar. 15, 1951. 14p. (NP-3057)

The vapor pressure of V has been determined over the temperature range 1666 to 1882°K by measuring the rate at which a metal surface evaporates into a vacuum. Values of ΔH_0^0 were calculated from individual vapor pressures and showed no appreciable trend, the average value being 121.95 ± 0.14 kcal. By combining this value with a linear expression in T for the difference in free energy functions between solid and gaseous V, the following vapor-pressure equation was obtained:

$$R \ln p = \frac{-121.95 \times 10^3}{T} - 5.123 \times 10^{-4}T + 36.29.$$

(auth)

MINERALS AND MINERALOGY

3696

Carbide and Carbon Chemicals Corp., Y-12
PROGRESS REPORT ON CARNOTITE STUDIES; CARBONATE PROCESS; AUGUST 1949. K. B. Brown, C. F. Coleman, and W. R. Grimes. Sept. 8, 1949. Decl. Apr. 23, 1951. 45p. (AECD-3142; Y-481)

A gas-volume method has been developed for rapid and accurate determination of the Na_2-CO_3 content in plant leach liquors. The procedure is described in detail, and comparative results are given of the analysis of leach solutions by the gas-volume method and by the standard evolution, direct-weight method. Data on the material build-up during carbonate cascade leaching of raw Indian Reservation ores have been tabulated. Preliminary results are given of a repeat experiment on the 3% Na_2CO_3 cascade on salt roasted ore. Studies have been completed on the solubility of synthetic carnotite and natural hand-picked carnotite in aqueous solutions of sodium carbonate, sodium vanadate, and sodium chloride. Previously reported data (Y-415, Y-441, and Y-460) are included along with the final results. Yellow- and red-cake precipitation methods have been studied for the recovery of U and V from carbonate leaches.

PHYSICS

3697

Laboratory for Nuclear Science and Engineering, Mass. Inst. of Tech.
PROGRESS REPORT; FEBRUARY 28, 1951. Feb. 28, 1951. 53p. (NP-3019)

The PIG positive ion gun for continuous and pulsed operation on the M.I.T. 12-Mev accelerator has been redesigned to simplify the electrode system in accordance with the drawings shown. Data are presented showing the response of 134 patients treated with 2-million-volt roentgen rays. A method is described for the preparation of $Ni(PBr_3)_4$ by the action of an excess of PBr_3 on $Ni(PCl_3)_4$. The electrolysis of ion-exchange resins has been studied using Ag and Zn anodes. Electrolysis of the system Pt | NaR | ZnR_2 | Zn is discussed. A tentative value of 3.59 barns has been determined for the total cross section of protons for neutrons of 1.3 Mev. The existence of ten excited states of the F^{20} nucleus has been established in the range of excited energies of 0 to 3.6 Mev. Spectra and energy-level diagrams are shown of observed protons from the $F^{19}(d,p)F^{20}$ reaction for a bombarding energy of 1.8 Mev. Q values and excitation energies for the observed levels are tabulated together with the results of others. Proton groups with energies from 2.2 to 6.5 Mev have been observed from thin targets of NaI for deuteron bombarding energies from 1.5 to 2.1 Mev. Q values and energy levels from the $Na^{23}(d,p)Na^{24}$ reaction are tabulated and compared with results of others. A detailed discussion is made of an investigation of the $Si^{30}(d,p)Si^{31}$ reaction. Proton groups have been observed with energies from 1.1 to 6.7 Mev. Two unreported proton groups were observed with Q values of 1.34 and 1.40 Mev. Data are presented in tabular form.

3698

Research Lab. of Electronics, Mass. Inst. of Tech.
QUARTERLY PROGRESS REPORT [TWENTIETH, FOR THREE-MONTH PERIOD ENDING DECEMBER 1, 1950]. A. G. Hill, J. B. Wiesner, and G. G. Harvey. Jan. 15, 1951. 107p. (NP-1947)

Physical Electronics. Progress is summarized on investigations of the thermionic work function and conductivity of (Ba,Sr)O-coated cathodes, thermionic emission from W, retarding potential and spectral energy distribution of Mo surfaces, photoelectric emission from quartz, and ionization-gage studies. Microwave Gaseous Discharges. Data on breakdown in H_2 at 100 Mc in a new cavity and on collision probability of electrons with gas atoms are given. Solid-State Physics. Results of extension of the energy-band theory to antiferromagnetism, with particular appli-

cation to MnO and related oxides, self-consistent field calculations for Cu^+, calculations of multiplet structure of molecular oxygen, theory of ferroelectricity of the TiO_6 complex and of the ilmenite ($LiNbO_3$ or $LiTaO_3$) structure, and determination with the soft-x-ray vacuum spectrograph of the valence band−2p transition in the emission band of Al are summarized. Low-temperature Physics. Some data on transportation of liquid He, pressure variation of second sound velocity and thermomechanical effect in liquid He II, magnetic dipole interactions in crystals, resistance-minimum measurements on Mg, and technique of measuring temperature and pressure dependence of viscosity of liquid He are included in a status report. Tube Research and Development. The status of testing and design of a high-power 10.7-cm magnetron and auxiliary equipment is summarized briefly. Calculations on noise and space-charge waves and operation of pulsed magnetrons into a high-Q load are given, and a 10^6-volt pulse transformer electron source is illustrated. Communication Research. Results of research on multipath transmission, statistical theory of communication, human communication systems, transient problems, and slightly lossy networks are reported.

Work on air navigation and analog computer research is reviewed briefly. Separate abstracts have been prepared on the following sections of this report: Ionization Gage Studies, p.6-8; Microwave Spectroscopy, p.33-43; Magnet Laboratory Research [Nuclear Magnetic Resonances], p.44-6.

COSMIC RADIATION

3699

DELAYS OF PENETRATING PARTICLES IN ATMOSPHERIC SHOWERS. L. Mezzetti, E. Pancini, and G. Stoppini. Phys. Rev. 81, 629-30(1951) Feb. 15. (Letter to the editor)

Preliminary results of an experiment concerning the relative delays among the particles of an atmospheric shower in reaching the recording device are reported. The experimental arrangement consists of three counter groups composed of 8 counters each. Measurements were taken with counter groups 1 and 2 always unshielded and 3 alternately shielded and unshielded. The results obtained are in fairly good agreement with those obtained by McCusker and coworkers (Nature 166, 400(1950)).

3700

THE INTEGRAL MULTIPLICITY OF MESON PRODUCTION. Kurt Sitte. Phys. Rev. 81, 628-9(1951) Feb. 15. (Letter to the editor)

The geomagnetic effects of the hard component have been analyzed by a method similar to that described previously (Phys. Rev. 81, 484(1951)) in an attempt to obtain additional information on the total number of mesons produced per primary cosmic-ray particle of given energy. The apparent slow variation with primary energy of the total number of relativistic mesons produced per primary particle, together with the marked energy dependence of the differential multiplicity, gives an indication of the spectral distribution of the mesons produced in a collision.

3701

THE NATURE OF SECONDARY RADIATION OF ORDINARY MESONS. Roland Maze and Jean Thouvenin. Compt. rend. 231, 1477-9(1950) Dec. 18. (In French)

Although the energy of a knock-on electron at an angle greater than 45° to the meson trajectory should, theoretically, be practically zero, certain secondary divergent effects may be observed in local showers. Pb-surrounded triple-coincidence counters, the distances between which may be varied, have been used to observe this divergence, attention being paid only to the effects arising from the hard component. Curves of coincidences with distance between two of the counters are presented for subsurface depths equivalent to 10.3, 20, and 75 m of H_2O. The divergence effects are explained as multiple scattering of a plane "source" of knock-on electrons produced by the meson flux.

3702

ON THE ABSORPTION OF A NUCLEON CASCADE. L. Jánossy. Proc. Roy. Irish Acad. 53A, 181-8(1950) Oct. 31.

In a recent study (Heitler and Jánossy, Proc. Phys. Soc. (London) 62, 374(1949)) the absorption of nucleons in homogeneous matter was investigated. The rate of decrease of nucleons of given energy was determined under certain assumptions. Proof is given that the derived equations can be applied to the absorption of nuclear cascades as well as to single nuclei.

3703

ON THE DENSITY SPECTRUM AND STRUCTURE OF EXTENSIVE AIR SHOWERS. S. F. Singer. Phys. Rev. 81, 579-92(1951) Feb. 15.

Experiments on the particle density spectrum and structure of extensive air showers were conducted in the Arctic regions by means of a G-M counter arrangement which allowed simultaneous measurements on showers of high and low densities. The mean densities investigated ranged from about 40 to 1000 particles/m^2. The integral density spectrum of shower particles at sea level was found to be $N(>\rho) = 562\rho^{-1.4}$/hr ($\rho$ in particles/m^2). With this spectrum it was possible to satisfy all the experimental data obtained with arrangements of various counter areas and multiplicities of coincidences. The decoherence curve of two counters, where extensive showers were first selected by a master coincidence, was found to be flat for small separations down to 7 cm, in disagreement with the results of other workers who did not select extensive showers. This result provides evidence against the existence of a large number of "cores" distributed throughout the extent of the shower. No latitude dependence of extensive showers was found between geomagnetic latitudes $\lambda = 50°$ and $\lambda = 80$ to 90°. (auth)

3704

A SEARCH FOR PRIMARY COSMIC GAMMA-RADIATION; I. Gilbert J. Perlow and C. W. Kissinger. Phys. Rev. 81, 552-4(1951) Feb. 15.

A search has been made for primary cosmic γ radiation in the energy range 3.4 to 90 Mev. The apparatus was a counter telescope in which ionizing rays were excluded by anticoincidence and γ rays were detected by their conversion products in lead. The apparatus was carried above the atmosphere in a V-2 rocket launched at White Sands, New Mexico. The recorded γ-ray counting rate is reduced about a factor of 2 by corrections of various sorts. The variation of detection efficiency with energy permits the results to be stated in terms of the energy crossing unit horizontal area in unit time. The result is 1.4 Mev/cm^2/sec. This is 1/1300 of the corresponding figure for the total cosmic-ray energy at this latitude. Considering the smallness of the result and the nature of the corrections, it is possible that the result is actually a null one. (auth)

3705

AN UNUSUAL NUCLEAR EVENT. Paul R. Barker. Phys. Rev. 81, 291(1951) Jan. 15. (Letter to the editor)

A nuclear event, unusual in that it produced two electron showers but no charged penetrating particles, has been observed in a cloud chamber operated at sea level. It is assumed that each shower was initiated by one of the photons resulting from the decay of a neutral π meson of extremely short lifetime.

INSTRUMENTS

3706

Carbide and Carbon Chemicals Div., UCC, K-25
CALIBRATION CHECKING DEVICE FOR RADIATION SURVEY INSTRUMENTS. S. A. Kingsbury. Mar. 16, 1951. 8p. (K-733)

A device has been developed which permits making a rapid, accurate check on the calibration of radiation survey instruments without the use of Ra standards. This device features a long half-life β-emitting standard which is permanently mounted inside the ionization chamber of the instrument. (auth)

3707

Carbide and Carbon Chemicals Co., Y-12
CONTINUOUSLY VARIABLE MAGNET POWER SUPPLY. W. D. Schultz. Mar. 8, 1951. 8p. (Y-737)

A continuously variable magnetic power supply has been developed which will deliver from 0 to 500 ma to a magnet of 1100 ohms resistance. Operational procedures and schematic circuit diagrams are given.

3708

Atomic Energy Research Establishment, Harwell, Berks. (England)
ANALYSIS OF A THREE-ELEMENT HELICAL TRANSMISSION LINE WITH THERMIONIC VALVE ACTION. I. A. D. Lewis. Dec. 1950. 24p. (AERE-G/R-611)

An analysis is made, using circuit theory, of a transmission line consisting of two helices in proximity to an earthed straight conductor (or a number of such conductors). Inductive and capacitative coupling between the two coils is taken into account, and it is shown that two waves (in each) direction) traveling with different phase velocities can coexist. A possible type of thermionic amplifier tube is envisaged which consists of a long straight cylindrical cathode surrounded concentrically by a helical grid and an outer helical anode. Valve action is allowed for by modifying the shunt admittance parameters associated with the two coils.

3709

Office of Naval Research, London
ELECTRONIC CALCULATING MACHINES AT S.E.A., PARIS. Sherman C. Lowell. Mar. 13, 1951. 6p. (ONRL-21-51)

Three electronic calculating machines are briefly described. Of these, one solves linear algebraic systems in ten unknowns, the others integro-differential equations both linear and nonlinear, with constant or variable coefficients. These machines have been used extensively for calculations connected with tracking and stability of guided missiles.

3710

EXPERIMENTAL STUDY OF AN ELECTRON GUN FOR ELECTRON DIFFRACTION. Paul Renaud. J. phys. radium 11, 619-21(1950) Nov. (In French)

A description is given of a high-efficiency electron gun furnishing a thin beam to be used without a diaphragm. Stability is obtained by providing a vacuum between two hemispherical lenses. The current intensity is much lower than 1 μa.

3711

FOCUSING OF A MOLECULAR BEAM BY A NONHOMOGENEOUS MAGNETIC FIELD. M. I. Korsunskiĭ and Ya. M. Fogel. Zhur. Eksptl'. i Teoret. Fiz. 21, 25-37(1951) Jan. (In Russian)

The possibility of focusing a molecular beam with the aid of an axial nonhomogeneous magnetic field was first pointed out by one of the authors (Korsunskiĭ, Zhur. Eksptl'. i Teoret. Fiz. 16, 151(1946)). In the present work several special magnetic fields, both axial and plane, capable of producing a double focusing of molecular beams, are examined, the influence of gravity on the motion of the molecules being taken into consideration. It is shown that with a specially devised plane, nonhomogeneous magnetic field a lens for molecular beams could be realized.

3712

Office of Naval Research, London
HIGH SPEED ELECTRONIC DIFFERENTIAL ANALYZER. W. Lewis Hyde. Jan. 11, 1951. 5p. (ONRL-8-51)

An electronic analog differential analyzer is discussed in which the most significant development is the powerful form of presentation of the results on a cathode-ray tube in a manner enabling the influence of three or more parameters to be observed simultaneously. In problems involving multiplication, accuracy of about 2.5% is attained at solution rates up to 25,000/sec. The instrument has been used to

study solutions to the one-dimensional Schroedinger equation for potential wells of various shapes. (auth)

3713

Atomic Energy Research Establishment, Harwell, Berks. (England)
A MODE-SEPARATION THEORY FOR HEAVILY-STRAPPED MAGNETRONS. A. W. Aikin. Dec. 1950. 12p. (AERE-X/R-608)

A general theory of the magnetron as a ring of networks has been given by Walker (Chap. 4, Vol. 6, of M.I.T. Radiation Laboratory Series, George B. Collins, ed. New York, McGraw-Hill, 1948), and Lines et al. (J. Inst. Elec. Engrs. (London) 97, Pt.III, 263(1950)) have recently indicated some of the properties of periodically loaded transmission lines, in particular the case of series loading with resonators, which is applicable to rising sun and linear magnetrons and to linear accelerators. The author has used a somewhat similar approach to the problem of predicting the mode separation for a heavily strapped magnetron using as a model a transmission line periodically loaded in shunt by resonators. Data have been produced for the prediction of mode separation for heavily strapped magnetrons of 6, 8, 10, and 12 segments, and the maximum mode separation likely to be attained for an operating voltage of 200 kv has been deduced. The theory has been applied to the Cavendish 25-cm internally strapped magnetron with good agreement.

3714

A MONOCHROMATOR FOR X-RAY POWDER CAMERA. Frances M. Wrightson and I. Fankuchen. Rev. Sci. Instruments 22, 212-13(1951) Mar. (Laboratory and shop note)

A simple crystal monochromator has been designed for use with a diffraction unit in powder-camera x-ray-diffraction studies. The large decrease in radiation usually associated with a monochromator has been offset by use of powder cameras having a slit collimator. The monochromator and slit systems are so designed that the adjustments required to change from filtered to monochromatic radiation and vice versa are easily performed. Diagrams with heavy backgrounds due to the presence of x-ray fluorescent material in the powders under study have been eliminated. Diagrams of materials, whether fluorescent or not, have been routinely obtained with monochromatic radiation, making corrections for lines due to Kβ radiation unnecessary. Photographs are shown of magnetite and a mixture of iron compounds as obtained with filtered and monochromatic radiation.

3715

A NEW TYPE OF ELECTROMAGNET; PART I. OPERATION AT 20-KW LEVEL. Francis Bitter and F. Everett Reed. Rev. Sci. Instruments 22, 171-3(1951) Mar.

An improved iron-core magnet weighing 2 tons has been designed for general laboratory use, and several units have been constructed. The design incorporates the desirable features of a number of earlier magnets and is engineered to give the optimum utility with minimum space and weight and with minimum attention by the operating personnel. A summary of test performance at 20 kw is given.

3716

Atomic Energy Research Establishment, Harwell, Berks. (England)
NOTE ON THE USE OF TETRA ETHYLENE GLYCOL (T.E.G.) AS A SPREADING AGENT IN THE PREPARATION OF UNIFORM PLUTONIUM SOURCES. R. Hurst and K. M. Glover. Feb. 1951. 3p. (AERE-C/M-100)

T.E.G. has been tried as a spreading agent in the production of uniform Pu sources and has been found satisfactory for all normal purposes. (auth)

3717

POTENTIAL AND FIELD OF A TYPE PECULIAR TO CYLINDRICAL LENSES. Émile Durand. Compt. rend. 232, 314-16(1951) Jan. 22. (In French)

Formulas are derived for the potential of an electronic lens consisting of two finite parallel half-planes arranged between two planes of indefinite extent, parallel to the first pair and carrying a different charge. Field contours are presented graphically.

3718

RADIANCE AMPLIFICATION BY MULTI-STAGE FLUORESCENCE SYSTEM. W. A. Shurcliff. J. Optical Soc. Am. 41, 209(1951) Mar. (Letter to the editor)

Brief note is made of an optical fluorescence amplifier system which is composed of a suitably arranged train of fluorescing bodies whereby the radiance at the scintillation counter may exceed that of the source. The proposed scheme requires that the fluorescence processor involved be reasonably efficient and that each body have a high absorption for radiation from the preceding body and low average absorption for its own fluorescent radiation.

MASS SPECTROGRAPHY

3719

COMPOUND TYPES IN GASOLINE BY MASS SPECTROMETER ANALYSIS. R. A. Brown. Anal. Chem. 23, 430-7 (1951) Mar.

Gasoline distillates and petroleum solvents may be analyzed according to compound type on a Consolidated Model 21-101 mass spectrometer equipped with a modified inlet system. Constituent compounds, such as aliphatic paraffins; cycloparaffins and/or monoolefins; cycloolefins, diolefins, and/or acetylenes; and aromatics are determined within ±4%. Monoolefins are determined by bromine number or nitrosation. Three man-hours is required for a complete analysis. It is believed the data presented can be used directly by other users of mass spectrometers. (auth)

3720

THE DETERMINATION OF ATOMIC MASS DOUBLETS BY MEANS OF A MASS SPECTROMETER. Alfred O.

Nier and T. R. Roberts. Phys. Rev. 81, 507-10(1951) Feb. 15.

A double-focusing mass spectrometer employing a 90° electrostatic analyzer followed by a 60° magnetic analyzer having a resolution sufficiently great to permit mass difference measurements by the familiar doublet method has been constructed. High stability is obtained by use of an auxiliary mass-spectrometer tube which compensates for fluctuations in both the magnetic field and the source of potential for the deflecting and accelerating plates of the main spectrometer. Ion currents are measured electrically, and data are recorded automatically. Numerous doublets were determined, and their values are listed in 10^{-4} amu. (auth)

MEASURING INSTRUMENTS AND TECHNIQUES

3721

Ames Lab.
NUCLEAR DISINTEGRATION STUDIES WITH A BETA-RAY SPECTROMETER. William W. Pratt. Aug. 1950. 93p. (ISC-119)

A method of improving the intensity-resolution relationship of a thin-lens magnetic β-ray spectrometer by means of ring focusing has been investigated. The existence of a ring-shaped constriction in the electron beam was demonstrated experimentally by a photographic-film method. The photographic mapping of the beam was used in designing an annular baffle. Optimum relations between annular width, solid angle, and counter-window diameter were investigated. A theoretical analysis has been carried out to determine relations from which the relative intensities of β rays, γ rays, and internal conversion electrons might be determined from data obtained with the spectrometer. Simplifying assumptions were made concerning the focusing action of the instrument. Formulas were derived from which the observed spectrometer counting rates due to sources of known activity, omitting β rays, γ rays, or internal conversion electrons, may be predicted. The application of the spectrometer to the methods of coincidence counting has been considered. The methods of coincidence spectrometry were applied to an analysis of the decay scheme of Hf^{181}. Both electron-electron and γ-electron coincidences were investigated. The efficiency of the γ counter used was determined by coincidence methods, using the known decay schemes of Co^{60} and ThB. 52 references.

3722

New York Operations Office
AN ALPHA SCINTILLATION COUNTER FOR LABORATORY MEASUREMENTS. R. T. Graveson, H. T. DiGiovanni, and H. D. LeVine. [nd] 34p. (NYO-1523)

A new α scintillation counter which is described in detail has the advantages of high geometry, low background counting rate, and low resolution loss. It is insensitive to both electrical and acoustical noise, and the low background rate of 2 counts/hr was obtained by careful attention to the details of power supply and chamber design. Also described is a simple, convenient technique for preparing the fluorescent counting surface. (auth)

3723

Radiation Lab., Univ. of California
LOW CAPACITY GIANT FISSION IONIZATION CHAMBER. J. DeJuren. Feb. 6, 1951. 11p. (UCRL-1090)

An ionization chamber for the detection of neutrons with an energy greater than 50 Mev is described in detail. A special electrode and circuit arrangement is employed to avoid high capacitance with large plate area. (auth)

3724

Atomic Energy Project, Univ. of Rochester
A QUENCHING CIRCUIT FOR GEIGER-MUELLER COUNTING OF CARBON 14 AS CARBON DIOXIDE. R. G. Vyverberg. Mar. 27, 1951. 22p. (UR-160)

A new quenching circuit for use with CO_2-filled G-M tubes is described in detail. The circuit uses a univibrator circuit with a conventional Geiger tube and a positive high-voltage supply and is able to produce long, flat, reproducible plateaus with CO_2 alone and very long, flat plateaus with a mixture of CO_2 and CS_2.

3725

MAGNETIC SPECTROMETER OF HIGH RESOLVING POWER FOR ELECTRON SPECTROSCOPY. V. S. Shpinel'. Zhur. Tekh. Fiz. 20, 834-46(1950) July. (In Russian)

In Doklady Akad. Nauk S.S.S.R. 53, 801(1946) the principle of a new magnetic electron spectrometer of high resolving power was announced. The design and construction details of this instrument, as well as its experimental testing, are described in the present paper. The magnetic field is transversely heterogeneous and axially symmetrical. Electrons, emitted from a source in the center of the field, are collected on the limiting orbit where the recording device is placed; the latter is either a Geiger counter or two counters working in coincidence. Under the conditions used in testing experiments, conversion lines of 0.5% half-width were obtained when only 3×10^{-3} of the whole solid angle was utilized. (auth)

3726

ON THE ANALYSIS OF QUENCHING CIRCUIT FOR SLOW COUNTERS. Goro Fujioka, Isao Kita, and Osamu Minakawa. J. Phys. Soc. Japan 6, 95-8(1951) Mar.-Apr.

A circuit designed by Johnson (Rev. Sci. Instruments 9, 218(1938)) is considered as an external quenching circuit for G-M slow counters. In effect the circuit is equivalent to a high-resistance leak to ground. Curves of the circuit and counting characteristics are presented.

3727

ON THE DISCHARGE MECHANISM OF SLOW COUNTER. Isao Kita. J. Phys. Soc. Japan 6, 99-103(1951) Mar.-Apr.

Pulse shapes of G-M slow counters have been studied, using an oscilloscope connected directly to the cathode of a counter with an external quenching circuit. Pulse shape,

height, rise time, and discharge mechanism of slow counters are discussed.

3728

ON THE TEMPERATURE EFFECT OF GEIGER-MÜLLER COUNTERS. Goro Fujioka, Isao Kita, and Osamu Minakawa. J. Phys. Soc. Japan 6, 103-7(1951) Mar.-Apr.

An investigation of the effect of temperature upon G-M counter characteristics has been made for the temperature range of 3 to 170°C. The threshold voltage was determined on an oscilloscope screen with the result that it appears not to be influenced by temperature variations. Counting characteristic curves for various temperatures reveal that the characteristics improve with higher temperatures. The occurrence of spurious discharges, "nachentladung" and "spontanentladung," are discussed.

3729

NEPA Div.
OPTIMUM DISTRIBUTION OF COUNTING TIME BETWEEN BACKGROUND AND SAMPLE. W. E. Browning. Feb. 23, 1951. 11p. (NEPA-1763)

Calculations were made of the best background-sample distribution of the time used in measuring the intensity of a radioactive sample. Expressions were developed for this distribution as a function of background-counting rate, sample-counting rate, and probable statistical error. The results are presented graphically in terms of counting time and in terms of accumulated counts. The total counting times required to achieve various values of desired statistical error are given for various values of background-counting rate, and sample-counting rate. (auth)

3730

Naval Radiological Defense Lab.
THE PERFORMANCE OF LUCITE-BONDED ALPHA SCINTILLATION SCREENS. (Technical Objective AW 5a). R. H. Davis, J. D. Graves, and P. J. Harris. Feb. 26, 1951. 15p. (AD-299(I))

Screens for α scintillation counters were constructed by pressing a phosphor and Al coating into a lucite backing. The α-counting characteristics of the screens have been compared with those of screens of equivalent weight constructed by depositing the phosphor coating on the lucite backings, and the effects of the differences in counting characteristics of the two types of screens are considered for various counting applications. The pressed screens are found to be mechanically superior and as efficient as conventional screens in applications where the sensitive area of the screen does not exceed the size of the field of view of the photomultiplier tube. (auth)

3731

PRECISE MEASUREMENT OF ENERGIES OF HEAVY CHARGED PARTICLES OF SHORT RANGES BY THE METHOD OF IMPREGNATED PHOTOGRAPHIC EMULSIONS. Henriette Faraggi. Ann. phys. (12) 6, 325-400(1951) Mar.-Apr. (In French)

It is shown that the method of loaded photoemulsions permits very accurate measurements of energies of short-range particles. The energy of α rays of Th^{232} is 3.98 ± 0.04 Mev, while the energy freed during the fission of Th^{232} under the action of fast neutrons is 140 ± 10 Mev. In 1% of the cases this fission is accompanied by an emission of a third particle, of small mass and low energy. By allowing a partial fading of the latent images to take place, it is possible to locate the origin of a transmutation by a gap produced through the fading in the terminal part of the impinging particle's trajectory. By this procedure the reactions $Li^6(n,\alpha)H^3$, $B^{10}(n,\alpha)Li^{7*}$, and $N^{14}(n,p)C^{14}$ were studied, and the validity of range-energy curves of Holloway, Livingstone, and Bethe were confirmed.

3732

SINGLE-CHANNEL ANALYZER. J. E. Francis, Jr., P. R. Bell, and J. C. Gundlach. Rev. Sci. Instruments 22, 133-7(1951) Mar.

A single-channel analyzer has been built for measuring the pulse spectrum from proportional and scintillation counters; it counts the number of pulses whose heights lie between E and E + ΔE. The interval ΔE or "window width" is constant within ±1.2% for all values of E between 0 and 90 v. Curves are presented which show that the analyzer performs satisfactorily on the random distribution of pulse amplitudes obtained from counters. (auth)

3733

Atomic Energy Research Establishment, Harwell, Berks. (England)
SOME NOTES ON THE NATURE OF EXPERIMENTS, ON THE STATISTICS OF COUNTING, AND ON THE FITTING OF EXPONENTIAL DECAY CURVES TO THE RESULTS OF COUNTING EXPERIMENTS. D. J. Behrens. Jan. 1951. 45p. (AERE-T/R-629)

Methods are described for the interpretation of results of counting experiments in nuclear physics and radioactive decay in general. The statistics of counting and the fitting of exponential decay curves to the results of counting experiments are discussed in detail.

3734

TIME-DELAYS IN LOW-VOLTAGE HALOGEN-QUENCHED GEIGER-MÜLLER COUNTERS. W. R. Loosemore and J. Sharpe. Nature 167, 600-1(1951) Apr. 14. (Letter to the editor)

Brief report is made of a study of time delay in a bromine-quenched G-M counter. Delays varied from 3.5 to 9.3 μsec with a peak at 5.3.

MESONS

3735

Rochester Univ.
ON THE REACTIONS $\pi^+ + D = P + P$. W. B. Cheston. Mar. 1951. 19p. (NYO-786)

The reactions $\pi^+ + d \rightleftarrows p + p$ have been investigated in weak-coupling approximation. Using detailed balancing arguments, it is shown that comparison of the total cross sections for both processes at appropriate energies allows a unique determination of the spin of the charged π meson independent of weak-coupling theory. It is also shown that the angular distribution of the final-state particles and the energy variation of the total cross sections also provide information as to the charged π meson spin. (auth)

3736

Rochester Univ.
MESON REACTIONS IN HYDROGEN AND DEUTERIUM. R. E. Marshak. [nd] 33p. (NYO-787)

A detailed analysis is made of data obtained in recent experiments with π-meson reactions in H and deuterium. From the two competing slow π^- reactions which have been observed in hydrogen it has been shown that the charged and neutral π mesons are both bosons and that the π^0 meson possesses spin 0 (or a spin greater than 1). Measurements of the γ-ray energies and intensities have provided accurate values for the masses of both π^- and π^0 and have permitted tentative conclusions to be drawn regarding the odd parity of the π^0 meson and the nature of its coupling to the nucleon. A study of the slow π^- absorption experiments in deuterium reveals that the charged π meson has either spin 0 and odd parity pseudoscalar) or spin 1 and even parity (pseudovector). 30 references.

3737

Rochester Univ.
MESON PHYSICS. R. E. Marshak. Apr. 12, 1951. 61p. (NYO-789)

The significant advances during 1950 in the laboratory study of mesons are presented in a detailed and authoritative review. Major attention is devoted to the experimental results obtained with accelerator-produced mesons, reference being made only occasionally to cosmic-ray research. The possible theoretical interpretation of an experimental result is indicated wherever it exists, but no detailed theoretical discussions are entered into. Divisions of the presentation are (1) photonic production of π mesons, (2) nucleonic production of π mesons, (3) properties of π mesons, (4) nuclear interaction of π mesons, and (5) properties of μ mesons. This review will appear as a chapter in "Nuclear Science Reviews of 1950."

3738

Rochester Univ.
THE CONTRIBUTION OF THE PAULI MOMENT TO π MESON PRODUCTION BY PHOTONS. M. F. Kaplon. Mar. 1951. 14p. (NYO-888)

A photon-nucleon production of π mesons has been calculated, incorporating in the interaction a Pauli-type term representing the interaction of the photon with the anomalous magnetic moments of the nucleons. The effect of the added interaction for the scalar theory is to increase somewhat the charged meson production while leaving the neutral production virtually unchanged. For the pseudoscalar theory the charged meson production is relatively unaffected while the neutral meson production is greatly enhanced. Comparison with the neutral meson experiments in hydrogen therefore favors the pseudoscalar theory. (auth)

3739

Radiation Lab., Univ. of California
EVIDENCE CONCERNING THE REACTION $P + P \rightarrow \pi^- + D$. Frank S. Crawford, Jr., Kenneth M. Crowe, and M. Lynn Stevenson. Jan. 26, 1951. 5p. (UCRL-1098)

The reaction $p + p \rightarrow \pi^- + d$ has been observed by a coincidence-counting technique. By using a magnetic field to determine the momentum of the particles and finding the range of both in Al the reaction products have been essentially identified by measuring the masses of both the meson and deuteron. The masses of the meson and deuteron were measured as 270(+80, −90) m_e and 2.2(+0.6, −0.4) proton masses, respectively.

3740

Radiation Lab., Univ. of California
MESON TO PROTON MASS RATIOS. Walter H. Barkas, F. M. Smith, and Eugene Gardner. Jan. 25, 1951. 4p. (UCRL-1107)

Magnetically selected protons and mesons from separate targets in a 184-in. cyclotron have been stopped in nuclear emulsions. Relative momenta and ranges were calculated and the following mass ratios were obtained: π^+/proton = 0.1511 ± 0.0006, π^-/proton = 0.1504 ± 0.0007.

3741

Radiation Lab., Univ. of California
SUMMARY OF THE RESEARCH PROGRESS MEETING OF JANUARY 25, 1951. Bonnie E. Cushman. Feb. 13, 1951. 12p. (UCRL-1131)

Note is made of the spectrographic investigation of the emission spectra of Cm. The lines identified are listed in tabular form. Two photographs are shown of the glove box used in the work because of the high activity of Cm. A brief discussion is made of efforts to measure the ratio of the cross section of the process $p + C \rightarrow \pi^0$ to the cross section of the reaction $p + p \rightarrow \pi^0$ using the external beam of the cyclotron. A short description is given of the method used in measuring the π^+ meson mass by which a value of 275.1 275.1 ± 1.7 electron masses was determined. The measurement of the meson mass was based on a previous experiment to determine the cross section of production by protons on protons using photographic-emulsion detectors.

3742

Radiation Lab., Univ. of California
AN ATTEMPT TO DETECT μ-MESON PAIRS FROM 322-MEV BREMSSTRAHLUNG. J. W. Mather, E. A. Martinelli, and W. N. Jarmie. Mar. 8, 1951. 7p. (UCRL-1166)

Results are given of several bombardments of Cu and CH_2 at 90° and CH_2 at 135° with 322-Mev bremsstrahlung of the Berkeley synchrotron in the determination of μ-meson

pair yield. These results are compared with the calculated yield. Both of the CH_2 results give an upper limit on the total μ-pair yield which is 3% of the (experimental) π^+ yield. Improvements for obtaining better results are discussed.

3743

Radiation Lab., Univ. of California
SUMMARY OF THE RESEARCH PROGRESS MEETING OF JANUARY 4, 1951. R. K. Wakerling. Mar. 12, 1951. 2p. (UCRL-1176)

Scattering of π Mesons by Aluminum. The experimental arrangement making use of the proton probe in the 184-in. cyclotron is illustrated. The scattered mesons were detected by photographic emulsion embedded in glass absorbers placed below the Al scatterer. From the first crude data a very tentative figure of 0.5×10^{-24} cm^2 for the scattering cross section is given.

3744

Radiation Lab., Univ. of California
ENERGY SPECTRUM OF ELECTRONS FROM μ-MESON. (abstract) Ryokichi Sagane, William L. Gardner, and Harmon Hubbard. [nd] 1p. (UCRL-1187)

The report is reproduced here in its entirety.
Energy spectrum of electrons from μ-meson decay has been studied with the use of artificial mesons produced at the target (Be, C, Al) by the bombardment with 345-Mev proton beam from the 184-in. cyclotron. Axially symmetric heterogeneous magnetic field has been used to get large solid-angle focusing of electrons emitted from the target located on the axis. A fairly good yield of decay electrons has been obtained, because it is expected that a considerable part of π mesons produced at the target by proton bombardment may remain in the target and decay into μ, which in turn mostly remain in the target and decay into electrons. Four anthracene crystals located close to the orbit are being used as scintillation counters. For a given magnetic field intensity, electrons of corresponding momentum will approach to the so-called "stable orbit" and go through four crystals giving quadruple coincidences. Energy spectrum obtained so far has maximum intensity at 70 mc ± 3 in momentum scale with maximum energy 53 Mev ± 2. Intensity at the maximum energy is almost zero or less than 1/10 of the intensity maximum. The distribution is quite similar to the theoretical curve given by Tiomns, Wheeler, and Rau with the assumption of $\mu^+ \rightarrow e^+ + 2\nu$ with $m_\nu \cong 0$ and tensor coupling in the antisymmetric theory with charge exchange. However, there remains a possibility that a linear combination of several different forms of couplings may also give an almost identical curve. If two neutral particles emitted at the moment of μ decay are thus assumed as neutrinos of $m_\nu \cong 0$, then our measurement gives a mass value of μ^+ meson to be $212\, m_0 \pm 5$.

3745

DIFFERENTIAL MULTIPLICITY IN MESON PRODUCTION. Kurt Sitte. Phys. Rev. 81, 484-5(1951) Feb. 1. (Letter to the editor)

Note is made of the evaluation of the differential multiplicity, the average number of mesons in a given energy level, of meson production for various primary energies as based on recent results of Conversi (Phys. Rev. 79, 749(1950)).

3746

GENERATION OF SINGLE MESONS BY γ QUANTA. A. M. Baldin and V. V. Mikhaĭlov. Zhur. Eksptl'. i Teoret. Fiz. 20, 1057-63(1950) Dec. (In Russian)

For the scalar, pseudoscalar, and vector variants, calculations are made of differential cross sections for the generation of charged mesons through the action of γ quanta on nucleons. Graphs show the angular distribution of the created mesons. This work was completed before its authors became acquainted with Brueckner's paper on the same subject (Phys. Rev. 79, 641(1950)) which differs, however, from the present work in that cross sections are obtained for couplings of meson and nucleon fields which do not contain derivatives of the meson functions.

3747

PRODUCTION OF μ MESONS BY GAMMA-RAYS. Peter A. Wolff. Phys. Rev. 81, 1056(1951) Mar. 15. (Letter to the editor)

Calculation of the ratio of μ-μ^0 pair-production cross section to π-production cross section has been made for the process in which μ mesons appear in unbound states as proposed by Wentzel (Phys. Rev. 79, 710(1950)) assuming a μ-meson field strongly coupled to the nucleon field by a pair-type interaction. For a maximum photon energy of 322 Mev the relative yield of μ-μ^0 pairs to π mesons was calculated to be 0.11 or 0.06, depending on the wave functions used.

3748

SCATTERING AND ABSORPTION OF SCALAR AND PSEUDOSCALAR MESONS BY NUCLEONS. Murray Peshkin. Phys. Rev. 81, 425-9(1951) Feb. 1.

Cross sections have been calculated for scattering of π mesons by nucleons and for absorption of the charge of the meson in the scattering process. Computations are carried out to second order in g^2, using scalar and pseudoscalar fields with scalar and pseudoscalar coupling, respectively. It is found that there are strong qualitative differences in the cross sections depending on the field type and on the type of mixture where neutral mesons are concerned. (auth)

NEUTRONS

3749

RADIOACTIVITY OF THE FREE NEUTRON. E. Shpol'skiĭ. Uspekhi Fiz. Nauk 42, 311-12(1950) Oct. (In Russian)

Two works that proved the disintegration of the neutron, viz., that of Snell et al. (Phys. Rev. 78, 310(1950)) and that of Robson (Phys. Rev. 78, 311(1950)) are reviewed briefly.

NUCLEAR PHYSICS

3750

BETA-DECAY AND MESON DECAY. Eduardo R. Caianiello. Phys. Rev. 81, 625(1951) Feb. 15. (Letter to the editor)

A discussion is presented of the possibility of reestablishing Yukawa's scheme of β decay by assuming the decay to occur through the creation of a virtual pseudoscalar π meson, which subsequently gives rise to an electron-neutrino pair. The possibility is rejected, confirming an earlier study by Nelson (Phys. Rev. 60, 830(1941)), the conclusion being that only a virtual vector meson can fit the Yukawa scheme.

3751

THE BINDING ENERGIES OF THREE- AND FOUR-PARTICLE NUCLEI. J. Irving. Phil. Mag. (7) 42, 338-50 (1951) Apr.

The binding energies of the nuclei H^3, He^3, and He^4 have been calculated by the standard variation method with a simple two-parameter wave function of a new form. Purely central interactions of the Yukawa and exponential types are considered. It is found that, when the nuclear parameters are chosen to fit the low-energy scattering and deuteron data, reasonable values are obtained for the three-particle nuclei, but the α-particle binding energy is too high. This result is in agreement with the calculations of Rarita and Present (Phys. Rev. 51, 788(1947)) for the exponential potential, and those of Svartholm for the Yukawa potential. In contrast with Svartholm's method of calculation, the potential and kinetic energies of the nuclei are obtained explicitly. In the case of the α particle, the Yukawa potential yields exceptionally high values for these quantities and results also in a very concentrated nucleus. The exponential potential, on the other hand, does not give rise to such high values for the potential and kinetic energies nor does it concentrate the nucleus to the degree of the former potential. (auth)

3752

THE FIRST FORBIDDEN SHAPE FACTOR AND THE f_0t PRODUCTS FOR BETA-DECAY. Jack P. Davidson, Jr. Phys. Rev. 82, 48-51(1951) Apr. 1.

The shape factor used in making Kurie plots for first-forbidden β-decay transitions with maximum spin change is expressed in a form suitable for computation. Graphs of the function for various Z and W are given. Approximations for the f_0t products of β decay are derived, enabling the computation of these products for certain types of transitions from the values of the allowed f_0 function. These results are used to compile a table of 1st-, 2nd-, and 3rd-forbidden transitions exhibiting the unique spectral shapes associated with maximum spin change for the given degree of forbiddenness. (auth)

3753

NOTE ON HIGHER ORDER EFFECTS IN BETA-DECAY. Eugen Merzbacher. Phys. Rev. 81, 942-5(1951) Mar. 15.

The exchange of a virtual light quantum between an electron and the nucleus which emits the electron in β decay is considered. The conditions are deduced under which this process can modify the decay probabilities and the selection rules. The special case of "strictly forbidden" transitions is discussed. (auth)

3754

NUCLEAR SPECTROSCOPY. H. Maier-Leibnitz. [In FIAT Review of German Science in 1939-1946, Wiesbaden, Dieterich'sche Verlagsbuchhandlung (vol.13, pt.1, paper 3.7 153-60)]. (In German)

A review is presented of the experimental work done in Germany during World War II for the measurement of nuclear excitation energies, for the study of excited states concomitant with α captures and α emissions, and for the determination of radioactive decay schemes. 12 references.

3755

PROGRESS IN NUCLEAR PHYSICS. O. R. Frisch (ed.) T. G. Pickavance, R. L. Fortescue, J. Rotblat, G. G. Scarrott, T. Skyrme, P. E. Cavenagh, H. A. C. McKay, and J. M. Cassels. London, Butterworth-Springer Ltd., 1950. 224p.

This book, divided into seven sections, presents material concerning the cyclotron, high-voltage d-c generators for nuclear research, photographic-emulsion techniques, electronic circuits for nuclear detectors, theory of β decay, spectroscopy of β and γ rays, the Szilard-Chalmers process, and crystal scattering of neutrons. 538 references.

NUCLEAR PROPERTIES

3756

Radiation Lab., Univ. of California
AN INTERPRETATION OF NUCLEAR CROSS SECTIONS FOR HIGH ENERGY NEUTRONS. Robert Jastrow. Feb. 21, 1951. 5p. (UCRL-1142)

Note is made of the calculation of nuclear cross sections for high-energy neutrons based on an optical model in which nuclear matter is described by an index of refraction and an absorption coefficient. 6 references.

3757

FINE STRUCTURE OF THE NUCLEAR MAGNETIC RESONANCE ABSORPTION. G. Khutsishvili. Uspekhi Fiz. Nauk 42, 324-7(1950) Oct. (In Russian)

A brief review of several works on the fine structure of the line of nuclear magnetic absorption by protons in various

substances, published in J. Chem. Phys. and Phys. Rev. during 1948-1950, is presented.

3758

FUNDAMENTALS OF NUCLEAR MAGNETIC RESONANCE ABSORPTION; II. G. E. Pake. Am. J. Phys. 18, 473-86 (1950) Nov. (See also NSA 5-1932)

This, the concluding portion of an article begun in Am. J. Phys. 18, 438(1950), continues with a description of experimental work covering apparatus for detecting nuclear resonance absorption, relation of the bridge signal to the nuclear susceptibilities, transient phenomena and direct measurement of T_1 (characteristic time relating to nuclear spin processes), and measurement of T_1 by progressive saturation. Concerning the width and structure of the resonance, sources of line broadening, the spin-spin interaction between pairs of like nuclei, the second moment as a measure of line width, the effect of motion on line width, and bond distances and internal motion in 1,2- dichloroethane are reported. A discussion of nuclear magnetic relaxation involves lattice motions, T_1, and other relaxation mechanisms.

3759

Research Lab. of Electronics, Massachussetts Inst. of Tech. MAGNET LABORATORY RESEARCH [NUCLEAR MAGNETIC RESONANCES], p.44-6 of QUARTERLY PROGRESS REPORT [TWENTIETH, FOR THREE-MONTH PERIOD ENDING DECEMBER 1, 1950.] F. Bitter, N. I. Adams III, J. Brossel, H. H. Plotkin, P. L. Sagalyn, and T. F. Wimett. Jan. 15, 1951. 3p. (NP-1947(p.44-6))

The ratio of the nuclear magnetic moments of Rb^{87} and Rb^{85} has been measured by direct comparison to be 2.033380 ± 0.000028, i.e., ± 1 in 73,000. The moment ratio obtained from the molecular beam value of the hfs splittings ratio is 2.0261 ± 0.0003. The low-field (1060 gauss) homogeneity of the barrel-type electromagnet is considered.

3760

Research Lab. of Electronics, Mass. Inst. of Tech. MICROWAVE SPECTROSCOPY, p.33-43 of QUARTERLY PROGRESS REPORT [TWENTIETH, FOR THREE-MONTH PERIOD ENDING DECEMBER 1, 1950]. M. W. P. Strandberg, R. E. Hillger, G. W. King, R. B. Lawrance, B. F. Burke, J. R. Eshbach, B. V. Gokhale, J. G. Ingersoll, H. R. Johnson, and M. T. Weiss. Jan. 15, 1951. 11p. (NP-1947(p.33-43))

Preliminary results of microwave absorption spectra of methyl mercaptan and of the deutero-ammonias NH_2D and NHD_2 are given. A diagram of a new system for ketene synthesis is presented, and absorption transitions of $H_2C_2^{12}O^{16}$, $D_2C_2^{12}O^{16}$, and $HDC_2^{12}O^{16}$ are tabulated. The structure of ketene is discussed. A measurement of the nuclear magnetic moment of S^{33} by the Zeeman effect of microwave rotational spectra of OCS^{33} has given as the final result $\mu = +0.632 \pm 0.010$ nuclear magneton. The complete pattern of transition frequencies used to determine the electric quadrupole coupling of the S^{33} nucleus in $O^{16}C^{12}S^{33}$ has been measured. The results agree with the value $eqQ(OCS^{33}) = -8.5 \pm 0.7$ given by Townes and Geschwind (Phys. Rev. 74, 626(1948)).

3761

ON THE DISPLACEMENT OF CORRESPONDING ENERGY LEVELS OF C^{13} AND N^{13}. Joachim B. Ehrman. Phys. Rev. 81, 412-16(1951) Feb. 1.

It is investigated to what extent the change in boundary conditions at the nuclear surface due to Coulomb wave-function distortion in the external region can explain the relative displacement of the first excited states of C^{13} and N^{13}. It is found that the calculated displacement is in the right direction and of a sufficiently large magnitude, but rather sensitively dependent on the definition of nuclear radius. (auth)

NUCLEAR TRANSFORMATIONS

3762

Ohio State Univ.
THE GAMMA-RAY YIELD OF PHOSPHORUS BOMBARDED WITH PROTONS. G. R. Grove and John N. Cooper. [nd] 8p. (AECU-1280)

Protons from the Ohio State University Van de Graaff generator have been used to study the reaction $P^{31}(p, \gamma)S^{32}$. The γ-ray yield has been measured as a function of proton energy in the region 400 to 1700 kev. Maxima in the γ-ray yield occur at proton energies of 440, 550, 650, 817, 890, 1067, 1100, 1129, 1162, 1265, 1421, 1458, 1495, 1538, 1583, and 1610 kev. Absorption measurements of the γ rays from the strongest resonance, that at 1265 kev, indicate a quantum energy of 12 Mev, which is consistent with the assumption that the compound nucleus decays to the ground state by a single transition. (auth)

3763

ALPHA- PARTICLE GROUPS FROM THE $N^{14}(d,\alpha)C^{12}$ and $N^{15}(d,\alpha)C^{13}$ REACTIONS. R. Malm and W. W. Buechner. Phys. Rev. 81, 519-22(1951) Feb. 15.

The α-particle groups from N^{14} and N^{15} targets bombarded with 1.4-Mev deuterons have been studied with a magnetic spectrometer. The Q value for the $N^{14}(d,\alpha)C^{12}$ reaction is found to be 13.575 ± 0.012 Mev, and the energies of the excited states observed in C^{12} are 4.438 ± 0.014 and 9.620 ± 0.013 Mev. For the $N^{15}(d,\alpha)C^{13}$ reaction, the Q value is measured as 7.681 ± 0.006 with excited states in C^{13} at 3.083 ± 0.005 and 3.677 ± 0.005 Mev. (auth)

3764

CROSS SECTIONS AND Q-VALUES FOR THE $C^{13} + D^2$ REACTIONS. C.W. Li and Ward Whaling. Phys. Rev. 82, 122-3(1951) Apr. 1. (Letter to the editor)

Results obtained in a study of the reaction products from the disintegration of C^{13} by deuterons, as analyzed with a 16-in. double-focusing magnetic spectrometer, are presented. The emitted particles, identified by their mv/Ze value and pulse size in a scintillation proportional counter, correspond to

the reactions $C^{13}(d,\alpha)B^{11}$, $C^{13}(d,p)C^{14}$, and $C^{13}(d,t)C^{12}$. The targets were prepared by depositing C^{13} on thin Ta strips prior to their bombardment by a deuteron beam of 1006 ± 1 kev from a Van de Graaff generator. Q values obtained are 5.164 ± 0.006, 5.940 ± 0.004, and 1.310 ± 0.003 Mev, respectively. These values are in good agreement with those obtained recently (Strait et al. Phys. Rev. 81, 747(1951)). In addition to the ground-state transitions, a group of α particles was observed which are identified with $C^{13}(d,\alpha)B^{11*}$, leaving B^{11} excited by 2.107 ± 0.017 Mev above the ground state. From a previously described method for obtaining nuclear reaction cross sections (Snyder et al. Rev. Sci. Instruments 21, 852(1950)), a differential cross section at 90° of 7 mb/steradian for $C^{13}(d,\alpha)B^{11}$ and 2 mb/steradian for $C^{13}(d,t)C^{12}$ was found for 0.99-Mev deuterons.

3765

ENERGY DISTRIBUTION OF FISSION FRAGMENTS FROM Pu^{239}. D. C. Brunton and W. B. Thompson. Can. J. Research 28A, 498-508(1950) Sept.

The experimental results obtained in this investigation were briefly described in a letter to the editor (Phys. Rev. 76, 848-9(1949); see NSA 3-1707). The present paper gives a more detailed description of the equipment used and the results obtained.

3766

EXCITATION FUNCTIONS OF THE (p,n) REACTION; I. J.-P. Blaser, F. Boehm, P. Marmier, and D. C. Peaslee. Helv. Phys. Acta 24, 3-38(1951) Feb. 15.

Excitation functions and absolute cross sections for (p,n) reactions have been investigated for the following initial nuclei: Cu^{63}, Cu^{65}, Zn^{66}, Zn^{67}, Zn^{68}, Ag^{107}, Ag^{109}, Cd^{110}, Cd^{111}, Cd^{112}, Cd^{114}, Sn^{117}, Sn^{120}, and Sn^{122}. The excitation functions have been measured by means of the stacked-foils method using protons of 6.5 Mev energy, and the cross sections were followed up to 10^{-29} cm^2. The case of Cu^{63} has been examined with high resolution in the region of the threshold. The energy scale in the $\sigma(E)$ diagrams was plotted using stopping-power values determined in the course of experiments. The results are compared with the statistical theory of the nucleus taking new theoretical values $\xi > 1$ for the sticking probability. Detailed discussion is given in the case of Cu^{63} where the theory shows good agreement with the experimental curve down to the threshold. The values of r_0 are shown to agree well with that found by neutron-induced reactions. (auth)

3767

THE FAST NEUTRON DISINTEGRATION OF C^{12} AND B^{10}. J. L. Perkin. Phys. Rev. 81, 892-3(1951) Mar. 1. (Letter to the editor)

Calculations have been carried out to identify 700 disintegration stars observed in a boron-loaded emulsion exposed to 24-Mev neutrons produced by the bombardment of Li with 7-Mev deuterons from the Cavendish Laboratory cyclotron. These calculations reveal 485 stars caused by the $C^{12}(n,n)3\alpha$ reaction, 100 stars caused by the $B^{10}(n,H^3)2\alpha$ reaction, 35 stars which could have been caused by either reaction, and 80 stars which did not satisfy either of the calculations. A histogram is shown of the values of the excited states of the intermediate nucleus Be^8 from the reaction $B^{10}(n,H^3)2\alpha$ and from the reaction $C^{12}(n,n)3\alpha$ (all possible and unique values) giving the values 2.65, 4.0, 7.25, 9.8, and 13.5 Mev. Percentage probability curves are shown for the formation of the foregoing excited states.

3768

THE PHOTO-DISINTEGRATION OF Be BY THE HIGH ENERGY γ-RAYS. Bunsaku Arakatsu, Masateru Sonoda, Yoshiaki Uemura, Shinjiro Yasumi, and Yoshio Saji. J. Phys. Soc. Japan 6, 66-7(1951) Jan.-Feb. (Short note)

Brief note is made of the photodisintegration of Be irradiated with high-energy γ rays of 6.13 and 17.6 Mev. A proportional counter, coated with a heavy layer of BeO, was subjected to γ radiation obtained by the proton bombardment of Li metal and CaF_2. In its disintegration, Be ejected α particles which were detected by the proportional counter.

3769

SLOW NEUTRON CROSS-SECTION OF BROMINE. P. A. Egelstaff and B. T. Taylor. Nature 167, 683(1951) Apr. 28. (Letter to the editor)

A corrected equation to account for Cl impurities is added to the original paper (Nature 166, 825(1950)).

PARTICLE ACCELERATORS

3770

Carnegie Inst. of Tech.
MAGNETIC MIDPLANE MEASUREMENTS. James Mates. Mar. 21, 1951. 5p. (NYO-778)

A current-conducting wire loop has been used to locate the magnetic midplane and the magnetic center of the Carnegie Institute of Technology cyclotron magnet. Procedures and results are given.

3771

MEASUREMENTS OF EFFECTIVE CROSS SECTIONS FOR CHANGE OF CHARGE IN IONS OF ALKALI METALS. M. M. Bredov and N. V. Fedorenko. Zhur. Tekh. Fiz. 20, 1464-75(1950) Dec. (In Russian)

The phenomenon of "change of charge," observed in ion beams moving through a gas and consisting of transfer of charge from ions to neutral gas atoms, has been studied by Shervin (Phys. Rev. 57, 814(1940)) and by Keene (Phil. Mag. 40, 369(1949)). The present authors question the methodology of these works, as ignoring or not adequately evaluating various secondary effects. In their own measurements of cross sections for change of charge in K^+ and Cs^+ beams, in the energy range 6 to 18 kev, moving through H_2, He, and air, the authors attempted to avoid the alleged sources of error,

both by a preliminary study of interfering secondary ionizations and by carefully removing secondary electrons and scattered ions from the measuring organs of the instrument. The numerical results differ notably from those obtained by the workers cited. The dependence of the effect under study on the gas pressure and ion energy was among the problems investigated. It was confirmed rigorously that the effect is produced directly by the ion beam and is due to a single-stage process.

3772

A NEW ELECTROSTATIC HIGH-VOLTAGE GENERATOR. P. Hemardinquer. Electricité 34, 254-6(1950) Oct. (In French)

A small electrostatic generator of the Wimshurst type has been developed which will produce an electrostatic field of 1500 to 2000 esu, with the possibility of extending the range up to 3000 esu. Having a cylindrical rotor carrying thick plates rather than foil, in a sealed container under a pressure of 20 to 30 atm, this generator can produce pressures of 10,000 to 200,000 volts with current intensities of 0.01 to 10 ma.

RADIATION ABSORPTION AND SCATTERING

3773

Los Alamos Scientific Lab.
PROPOSED MEASUREMENT OF THE NEUTRON-HELIUM SCATTERING CROSS SECTION AND ANGULAR DISTRIBUTION BETWEEN 0.6 AND 2.5 MEV. H. Staub. Jan. 12, 1944. Decl. Apr. 24, 1951. 3p. (AECD-3147; LADC-917)

An experimental setup is described for a proposed study of the scattering cross section and angular distribution of scattered neutrons by observation of the number and size of recoils in a He-filled ionization chamber, irradiated with monochromatic neutrons.

3774

THE DIRECTIONAL DISTRIBUTION OF PHOTO-ELECTRONS EJECTED BY POLARIZED QUANTA. Frank L. Hereford. Phys. Rev. 81, 627-8(1951) Feb. 15. (Letter to the editor)

The results of a study based upon an earlier note (Phys. Rev. 81, 482(1951)) on the azimuthal asymmetry in the directional distribution of photoelectrons ejected coincidentally by annihilation radiation are presented.

3775

ELECTRON-ELECTRON SCATTERING FROM 0.6 TO 1.7 MEV. Lorne A. Page. Phys. Rev. 81, 1062-3(1951) Mar. 15. (Letter to the editor)

Measurement has been made of the differential cross section for elastic scattering of negative β particles by atomic electrons, using a method whereby the two energetic electrons arising from a collision are detected individually in two G-M counters connected in coincidence. Using 10 mc of $Sr^{90}-Y^{90}$ as a β emitter, and scattering foils of 0.5 mg/cm^2 collodion and 4.5 mg/cm^2 Be, results were obtained which show the variation of the relative differential cross section against fractional energy transfer at a fixed incident energy, E = 3.5 mc^2, and for the absolute differential cross section as a function of incident kinetic energy.

3776

PHOTONS AND ELECTRONS. K. H. Spring. New York, John Wiley & Sons, Inc., 1950. 108p.

A concise account of the interaction of electrons with photons at high energies is contained in this volume. The topics discussed include the photoelectric effect, the Compton effect, the production of bremsstrahlung and x rays, pair production, and the formation of cosmic-ray showers. A more complete review by G. Groetzinger has appeared in Am. J. Phys. 19, 192(1951) Mar.

RADIATION EFFECTS

3777

Oak Ridge National Lab.
FADING CHARACTERISTICS OF GAMMA INDUCED COLORATION IN HIGH DENSITY GLASS. Robert H. Kernohan and Grace M. McCammon. Mar. 20, 1951. 19p. (ORNL-975)

Specimens of a Pb silicate glass have been measured for transmission characteristics. The specimens were given varying dosages from a 300-c Co^{60} source. Transmission characteristics were measured as function of time following irradiation. The induced coloration faded and this fading could be accelerated by illuminating the specimens with an ordinary light bulb. All specimens nearly recovered their original transmission characteristics. (auth)

RADIOACTIVITY

3778

Radiation Lab., Univ. of California
MASS ASSIGNMENT OF 14.6-HOUR YTTRIUM POSITRON ACTIVITY. S. V. Castner. Jan. 31, 1951. 6p. (UCRL-1099)

A new Y activity has been found, growing from a Zr isotope which decays by means of electron capture with a half-life of 17 hr. This Y activity decays with a half-life of 14.6 hr by positron emission and γ radiation. The γ radiation has an energy of approximately 1.3 Mev by a Pb absorption measurement. This 14.6-hr activity has been assigned to Y^{86} on the interpretation of experimental results.

3779

β-SPECTROMETER INVESTIGATIONS ON ELECTROMAGNETICALLY SEPARATED Xe^{135} AND Kr^{79}. Ingmar Bergström. Phys. Rev. 82, 112-13(1951) Apr. 1. (Letter to the editor)

Note is made of the β-spectrometer investigation of Xe^{135} and Kr^{79} obtained by magnetic separation of fission products. The Fermi plot of Xe^{135} is shown to be a straight line from the upper limit of 905 ± 10 kev. K and L conversion lines corresponding to a γ-ray energy of 248 ± 2 kev are in agreement with results of Peacock et al. (Revs. Modern Phys. 20, 585(1948)). The β spectrum of Kr^{79} shows it to decay by a very strong K capture with a half-life of 34 ± 4 hr. Two conversion lines were observed corresponding to γ energies of 44 and 263 kev.

3780

DECAY OF Mo^{99} AND ISOMERISM OF Tc^{99}. H. Medicus, D. Maeder, and H. Schneider. Helv. Phys. Acta 24, 72-88 (1951) Feb. 15. (In German)

The decay of Mo^{99}, produced by slow-neutron irradiation of Mo^{98} in the Harwell pile, has been investigated with β spectrometer and coincidence counters, and an energy-level diagram is presented. About 87% of the β decay goes to a Tc isomeric state, the transition energy of which is only 1.8 kev. This isomeric transition is followed by electric-dipole γ radiation of 141 kev energy. The portion of the Mo^{99} decaying directly to the Tc^{99} ground state emits 728- and 141-kev γ quanta in cascade. The presence of weak γ lines of 182 and 360 kev energy is discussed.

3781

EXPERIMENTS ON THE EMISSION OF NEUTRINOS FROM P^{32}. Chalmers W. Sherwin. Phys. Rev. 82, 52-7(1951) Apr. 1. (See also NSA 3-890)

These experiments study energy and momentum conservation in β decay. The apparatus, improved over earlier experiments, permits increased accuracy in the measurement of the neutrino-electron angular correlation. It is concluded that the correlation is approximately $(1 + \cos \theta)$. Determination of the nature of the dominant interaction in the β decay of P^{32} awaits measurement of the nuclear spin. If the spin is one, the tensor interaction is uniquely selected. If the spin is zero, the axial vector dominates. Spin 2 or higher is ruled out by the shape of the β spectrum. It is also demonstrated that in β decay the missing energy and the missing momentum obey the relation $p = E/c$ to an accuracy of better than 10%. (auth)

3782

A LINEAR RELATION COMMON TO ALL α EMITTERS OF THE NATURAL RADIOACTIVE FAMILIES. Charles Martin. Compt. rend. 231, 1467-8(1950) Dec. 18. (In French)

The study of Curie and Fournier (Compt. rend. 191, 326 (1930); J. phys. radium 6, 28(1935)) on the relation between the number $\frac{3}{4}A - Z$ and the radioactive constant has been extended by plotting all known α emitters through Cf. Linear relations of various slopes are shown. The influence of the nuclear structure containing 82 protons and 126 neutrons is particularly well demonstrated.

3783

NATURALLY OCCURRING RADIOACTIVITY IN SOME ORGANIC AND INORGANIC AGRICULTURAL MATERIALS; II. SOME TABLES AND A CONCLUSION. Helge Bergh. Kgl. Norske Videnskab. Selskabs Forh. 23, No. 6, 21-25(1950) Sept. 5. (See also NSA 5-2963)

Four tables of data are presented, showing radioactivity occurring naturally in animals, vegetables, soil and different minerals, fertilizers, and chemicals. It is concluded that more or less naturally occurring radioactivity is found in most common agricultural materials.

3784

ON THE ISOMERISM OF Kr^{83} AND Xe^{133}. Ingmar Bergström. Phys. Rev. 81, 638-9(1951) Feb. 15. (Letter to the editor; see also NSA 4-3223)

Note is made of results obtained from β-spectrometer investigation of electromagnetically separated Kr^{83m} and Xe^{133m} obtained through fission. By using a thin G-M window in the β spectrometer, four electron lines of energies 7.3, 9.0, 10.5, and 12.1 kev were found for Kr^{83m}. All possessed a half-life of ~114 min. The first two lines are interpreted as the L and M lines of a γ ray of 9.3 kev energy. The last two have energies in agreement with the Auger lines K-2L and K-L-M of Kr. From Xe irradiated in the Harwell pile it was possible to determine the half-life of Xe^{133m} as 2.30 ± 0.08 days. These data are supplementary to those presented earlier on this subject (see NSA 4-3223 and 4-5781).

3785

ON THE POSSIBILITY OF EMISSION IN β^+ AND β^- RADIOACTIVITY OF A DISTINCT PARTICLE HAVING THE CHARGE OF AN ELECTRON. C. Charpak and F. Suzor. Compt. rend. 231, 1471-3(1950) Dec. 18. (In French)

Experiments, described briefly, which contrast the absorption and backscattering behavior of β radiation (Co^{60}, P^{32}, Na^{22}) with that of electrons (Tc^{99m}) lead the authors to suggest that β radiation is composed of particles distinct from electrons. These particles are transformed into electrons by inelastic collisions in less than 6-mg/cm² thicknesses of matter.

3786

THE POSITRON ACTIVITY OF K^{40}. Stirling A. Colgate. Phys. Rev. 81, 1063-4(1951) Mar. 15. (Letter to the editor)

Brief note is made of the possibility of positron activity in K^{40}. A study of the annihilation quanta gives no evidence that the observed coincidence rate from K comes from positrons, but suggests that the observed coincidence rate arises from the backscattering of 1.5-Mev γ rays. The lifetime of the excited state of A^{40} was observed to be less than 1 sec.

THEORETICAL PHYSICS

3787

A GENERALIZATION OF THE UNCERTAINTY PRINCIPLE. Augusto Gamba. Atti accad. nazl. Lincei, Classe sci. fis. mat. e nat. (8) 8, 606-8(1950) June. (In Italian)

In Nuovo cimento (9) 7, 378(1950) the author derived for the uncertainty principle a more restrictive inequality than that obtained by Born ("Natural Philosophy of Cause and Chance," Oxford, 1948). The possibility is discussed of the derivation of a still more restrictive inequality.

3788

GENERALIZED POTENTIALS IN THE THEORY OF SPIN-1 PARTICLES IN THE PRESENCE OF THE SOURCE, AND THE FUNDAMENTAL DIFFICULTY IN MESON THEORY. Bernard Kwal. Compt. rend. 232, 37-8(1951) Jan. 3. (In French)

The introduction of a generalized potential presenting a close analogy to the Maxwell potential leads to a reinterpretation of the concept of fields and potentials in the theory of particles of spin 1. Confusion between the notions of fields and potentials is shown to have been one of the fundamental difficulties of meson and nuclear theory.

3789

A NOTE ON TIME REVERSAL AND THE DIRAC EQUATION. L. Biedenharn. Phys. Rev. 82, 100(1951) Apr. 1. (Letter to the editor)

Note is made of a proposed generalization of the Dirac equation postulating the invariance of $\psi\dagger\psi$. Equations are considered having all real elements in which ψ is an 8-rowed column vector, and the matrices are 8 by 8.

3790

ON THE FORMALISM OF LINEAR FIELD THEORIES. Helmut Steinwedel. Z. Naturforsch. 6a, 123-33(1951) Mar. (In German)

In the framework of linear generalizations of the classical electrodynamics, as given by Bopp (Ann. Physik 42, 573(1943)) and Feynmann (Phys. Rev. 74, 939(1948)), a close examination is made of the field equations, their general solutions, and the value of the static potential furnished by them; "hyperbolic" field equations are submitted to a similar study. The methods used can be applied to other field types, such as scalar, spinor, and charged fields. The requirements of a divergence-free theory lead to the known regularization postulates of Pauli and Villars (Revs. Modern Phys. 21, 434(1949)). (auth)

3791

ON THE QUANTUM THEORY OF THE ELEMENTARY PARTICLES; I. INTRODUCTION AND CLASSICAL FIELD DYNAMICS. K. V. Roberts. Proc. Roy. Soc. (London) 204A, 123-44(1950) Nov. 22.

The first of a series of papers concerned with formal aspects of the theory of elementary particles is presented. It introduces a classical approach to the interaction representation of Tomonaga and Schwinger, based upon a generalization of analytical dynamics due to Weiss. General rules are deduced for constructing the interaction Hamiltonian function, and it is explained how the consistency of the representation may be established. The classical part of the theory is developed in detail. (auth)

3792

ON RELATIVISTIC SYMMETRY IN NONSUPERQUANTIZED FORMALISM. Olivier Costa de Beauregard. Compt. rend. 231, 1423-5(1950) Dec. 18. (In French)

The conjugate use of the author's generalized definition of the Hermitian scalar product (Compt. rend. 225, 626(1947)) and Arnous' definition of the eigenfunction for Hermitian operators (J. phys. radium 8, 87(1947)) is shown to furnish, within the framework of the theory of particles with spin, a relativistic symmetrization of the formalism. The operators H_t and ∂_t are compared. A formula of Fock and Krylov (J. Phys. U.S.S.R. 11, 116(1947)) is discussed.

3793

RADIATION CORRECTIONS FOR DIRAC'S EQUATIONS IN A NONRELATIVISTIC APPROXIMATION. A. A. Abrikosov and I. M. Khalatnikov. Zhur. Eksptl'. i Teoret. Fiz. 21, 69-78(1951) Jan. (In Russian)

A calculation is made of the shift in the energy levels of an electron in an external field produced by the interaction with the electron's own radiation field. Divergences appearing in the calculation are removed by discarding terms which are independent of the outer field. A new method for the derivation of reduction relations is employed, not requiring the use of the Pauli equation. (auth)

3794

THE SINGULAR FUNCTIONS OF THE KLEIN-GORDON EQUATION, CONSIDERING AN EXTERNAL MAGNETIC FIELD. J. Géhéniau. Physica 16, 822-30(1950) Dec. (In French; see also NSA 5-1407)

The singular solutions of the relativistic equation of Schroedinger, ıor a particle with charge e and rest mass m, placed in a uniform and constant magnetic field, are given in various forms without any approximation in relation to this field. (auth)

3795

THE THEORY OF THE TRAVERSING OF POTENTIAL BARRIERS BY PARTICLES. G. F. Drukarev. Zhur. Eksptl'. i Teoret. Fiz. 21, 59-68(1951) Jan. (In Russian)

The exit of a particle from a region bounded by a spherically symmetric potential barrier is examined as a nonstationary problem of quantum mechanics. The wave function outside the barrier is studied in detail. Thus, for the special case of a particle which, at a moment $t = 0$, has been inside the barrier in one of the quasi-stationary states, it can be shown that, after a sufficiently long lapse of time, the modulus of the particle's wave function will first increase exponentially with the distance while $r < vt$ (v is the velocity of the particle), then decrease abruptly for $r > vt$, and vanish as $t \to \infty$. In the general case of an arbitrary initial state, the particle's wave function outside the barrier is a sum composed both of terms corresponding to the dissolution of various quasi-stationary states and of terms describing the spreading of the wave packet. (auth)

AUTHOR INDEX

For each reference the digit preceding the dash is the volume number and digits after the dash are the abstract number.

ABRIKOSOV A A
5-3793
ADAMS N I III
5-3759
AERONAUTICAL MATERIALS LAB NAVAL AIR EXPERIMENTAL STATION PHILADELPHIA
5-3693
AIKIN A W
5-3713
AIRCRAFT ENGINE RESEARCH LAB NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS
5-3674
ALFRED UNIV
5-3683
AMERICAN SMELTING AND REFINING CO
5-3689
AMES LAB
5-3644 5-3721
ANDREWS A I
5-3685
ARAKATSU BUNSAKU
5-3766
ARGONNE NATIONAL LAB
5-3658
ATOMIC ENERGY PROJECT UNIV OF CALIFORNIA LOS ANGELES
5-3596 5-3597 5-3601 5-3602 5-3603 5-3617 5-3646
ATOMIC ENERGY PROJECT UNIV OF ROCHESTER
5-3621 5-3622 5-3724
ATOMIC ENERGY RESEARCH ESTABLISHMENT HARWELL BERKS ENGLAND
5-3626 5-3708 5-3713 5-3716 5-3733

BACKHOUSE J R
5-3637
BAHNER CARL T
5-3654
BALDIN A M
5-3746
BARKAS WALTER H
5-3740
BARKER PAUL H
5-3705
BARR JOHN T
5-3654
BATES A G
5-3686
BAZIN SUZANNE
5-3605
BECK WILLIAM S
5-3596 5-3597
BEHRENS D J
5-3733
BELL P R
5-3734
BENNETT LEONARD L JR
5-3631
BERGH HELGE
5-3763
BERGSTROM INGMAR
5-3779 5-3784
BERNSTEIN R B
5-3653
BIEDENHARN L
5-3769
BISCHOFF FRIEDRICH
5-3650
BITTER FRANCIS
5-3715 5-3759
BLACKBURN PAUL E
5-3695
BLASER J P
5-3766
BLOUGH R R
5-3655

BOEHM F
5-3766
BOTHNER-BY AKSEL A
5-3672
BOULD C
5-3613
BRADLEY D C
5-3643
BREDOV M M
5-3771
BRIX PETER
5-3664
BROIDA H P
5-3670
BROOKHAVEN NATIONAL LAB
5-3672
BROSSEL J
5-3759
BROWN F H JR
5-3684
BROWN K B
5-3696
BROWN META S
5-3604
BROWN R A
5-3719
BROWNING W E
5-3729
BRUNTON D C
5-3765
BRYAN CARL E
5-3631
BUECHNER W W
5-3763
BURKE B F
5-3760
BURNESS D M
5-3655

CAIANIELLO EDUARDO R
5-3750
CARBIDE AND CARBON CHEMICALS CORP Y-12
5-3696 5-3707
CARBIDE AND CARBON CHEMICALS DIV UCC K-25
5-3654 5-3706
CAREY M M
5-3598
CARNEGIE INST OF TECH
5-3691 5-3770
CASSELS J M
5-3755
CASTNER S V
5-3778
CAVENAGH P E
5-3755
CHANCE FRANKLIN S JR
5-3667
CHARPAK C
5-3785
CHESTON W B
5-3735
CHICAGO UNIV
5-3624 5-3662
CHRISMAN C H JR
5-3642
CLAFFY E W
5-3663
CLARK JOHN A
5-3677
COHN STANTON H
5-3609
COLEMAN C F
5-3696
COLGATE STIRLING A
5-3786
COOPER JOHN N
5-3764
CORYELL C D
5-3639
COULTER M P
5-3621 5-3622
CRANDALL W B
5-3683

CRAWFORD FRANK S JR
5-3739
CROWE KENNETH M
5-3739
CRYOGENIC LAB OHIO STATE UNIV
5-3695
CUSHMAN BONNIE E
5-3741

DAMIANO V V
5-3635
DAVIDSON JACK P JR
5-3754
DAVIS R H
5-3730
DE BEAUREGARD OLIVIER COSTA
5-3794
DELOUNSEY ELBERT
5-3612
DEJUHEN J
5-3723
DIGIOVANNI H T
5-3724
DOWDY ANDREW H
5-3617
DRUKAREV G F
5-3795
DUNKERLEY F J
5-3635
DURAND EMILE
5-3717
DUWEZ POL
5-3664
DWYER F P
5-3636 5-3637

EASTWOOD W S
5-3626
ECKSTEIN RICHARD W
5-3630
EDWARDS JAMES W
5-3695
EGELSTAFF P A
5-3759
EHRMAN JOACHIM B
5-3701
ELY J O
5-3614
ENTENMAN CECIL
5-3606
ESHBACH J R
5-3700
EVERHART J L
5-3669

FANKUCHEN I
5-3632 5-3714
FARAGUI HENRIETTE
5-3731
FARIS F E
5-3660
FASSEL VELMER A
5-3644
FEJUKENKO N V
5-3771
FEIGL FRITZ
5-3648
FELDMAN C
5-3641
FIELDS MELVIN
5-3671
FINGER G C
5-3635 5-3650 5-3657
FINNERTY J L
5-3637
FOGEL YA M
5-3711
FORBES GILBERT B
5-3632
FORT D M
5-3635
FORTESCUE R L
5-3755
FOX H W
5-3642